

STANDARDS DEVELOPMENT BRANCH ONCE



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CANADIAN RESEARCH CATALOGUE

ON

LRTAP & ACID RAIN

ACTIVITES DE RECHERCHE AU CANADA

SUR LE

TGDPA &

LES PRECIPITATIONS

ACIDES

1986



ACID RAIN

PLUIES ACIDES



Province of
British Columbia
Ministry of
Environment

Gouvernement du Québec
Ministère de l'Environnement

New Brunswick



Department of Municipal
Affairs and Environment

Alberta
ENVIRONMENT



Saskatchewan
Environment



Community & Cultural Affairs

Manitoba
Environment
and Workplace
Safety and Health



Department of the
Environment



Ministry
of the
Environment
Ontario



Province of Newfoundland
Department of the Environment

Canada

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The Canadian research activity
catalogue on the long-range
transport of air pollutants and
acidic precipitation.

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THE CANADIAN RESEARCH ACTIVITY CATALOGUE
ON
THE LONG-RANGE TRANSPORT OF AIR POLLUTANTS
AND ACIDIC PRECIPITATION

CATALOGUE DES ACTIVITÉS DE RECHERCHE AU CANADA
SUR
LE TRANSPORT A GRANDE DISTANCE DES POLLUANTS ATMOSPHÉRIQUES ET LES
PRÉCIPITATIONS ACIDES

FEBRUARY/FÉVRIER

1986

17517

Federal LRTAP Liaison Office
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario
M3H 5T4

Bureau Fédéral de Liaison du TGDPA
Service de l'environnement atmosphérique
4905, rue Dufferin
Downsview (Ontario)
M3H 5T4

FOREWORD

In 1981 and in 1983, my office compiled a catalogue of Canadian research projects on the long-range transport of air pollutants (LRTAP) and acid rain. The catalogue has been used as a reference by scientists, program managers, policy makers, and the general public. It is time again to provide an update.

This third edition (1986) of the catalogue contains descriptions of 319 research projects on the causes and effects of acid rain. Research on acid rain control technology, an area in which we will see increased activity over the next few years, has not been included. The projects have been numbered and are listed according to subject as indicated in the Table of Contents. Within a subject section, projects are arranged according to the geographical location of the study area, from west to east. An author index is included at the end of the catalogue.

The catalogue has been compiled from the responses to questionnaires completed by project managers and program coordinators in the federal and provincial governments, industry and academic institutions. I would like to thank all participants for taking the time to assist me.

Further information on the federal and provincial research programs can be obtained by contacting the individuals listed on pages v and vi or the scientists identified in each project report.



H.C. Martin
Federal LRTAP Liaison Office
February, 1986

AVANT-PROPOS

En 1981 et en 1983, mon bureau a dressé un catalogue des projets de recherche canadiens sur le transport à longue distance des polluants atmosphériques (TGDPA) et sur la pluie acide. Ce document a servi de référence aux scientifiques, aux directeurs de programmes, aux décisionnaires et au grand public. Le moment est venu de le remettre à jour.

Cette troisième édition (1986) du catalogue donne la description de 319 projets de recherche sur les causes et les effets de la pluie acide. Nous avons exclu la recherche sur les techniques de lutte contre les pluies acides, domaine où l'activité s'intensifiera au cours des prochaines années. Les projets y sont numérotés et inscrits par sujet suivant la table des matières. Dans une catégorie donnée de sujet, les projets sont classés selon le lieu géographique du domaine d'étude, de l'ouest à l'est. Le répertoire des auteurs figure à la fin du catalogue.

Nous avons établi cet ouvrage d'après les réponses données à des questionnaires par des directeurs de projets et des coordonnateurs de programmes du gouvernement fédéral et des gouvernements provinciaux, de l'industrie et des établissements universitaires. Je remercie tous les participants d'avoir pris le temps de m'aider.

Pour obtenir de plus amples renseignements sur les programmes fédéraux et provinciaux de recherche, vous pouvez vous adresser aux personnes énumérées à les pages v et vi ou aux scientifiques identifiés dans chaque rapport de projet.



H.C. Martin
Bureau fédéral de liaison du TGDPA
Février 1986

FEDERAL LRTAP - ACID RAIN CONTACTS

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Environmental Protection Service
Environment Canada
Place Vincent Massey
351 St. Joseph Boulevard
Hull, Quebec K1A 1G4
Phone: (819) 997-4334

Atmospheric

E. Wilson
Atmospheric Environment Service
Environment Canada
4905 Dufferin Street
Downsview, Ontario M3H 5T4
Phone: (416) 667-4797

Aquatic Chemistry

F. Elder
Canada Centre for Inland Waters
Environmental Conservation Service
Environment Canada
867 Lakeshore Road
Burlington, Ontario L4R 4A6
Phone: (416) 336-4969

Aquatic Biology

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Fisheries & Oceans Canada
200 Kent Street
11th Floor
Ottawa, Ontario K1A 0E6
Phone: (613) 990-0206

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Canadian Wildlife Service
National Wildlife Research Center
100 Gamelin Boulevard
Ottawa, Ontario K1A 0E7
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Canadian Forestry Service
Agriculture Canada
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Phone: 997-3350

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Office of Environmental Affairs
Energy, Mines and Resources
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Ottawa, Ontario K1A 0E4
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C. Rubec
Lands Directorate
Environmental Conservation Service
Environment Canada
Place Vincent Massey
351 St. Joseph Boulevard
Hull, Quebec K1A 0E7
Phone: (819) 997-2320

Agriculture

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Agriculture Canada
Sir John Carling Building
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930 Carling Avenue
Ottawa, Ontario K1A 0C5
Phone: (613) 995-7084

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C. Franklin
Health & Welfare Canada
Room 118, Environmental Health Centre
Tunney's Pasture
Ottawa, Ontario K1A 0L2
Phone: (613) 990-8888

Materials

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Industrial Material Research Institute
National Research Council of Canada
75 de Mortagne
Boucherville, Quebec J4B 6Y4
Phone: (514) 641-2280

PROVINCIAL LRTAP - ACID RAIN CONTACTS

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British Columbia Environment
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Victoria, B.C.
V8V 1X5
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Alberta Environment
14th Floor
10405 Jasper Avenue
Edmonton, Alberta
T5J 3N4
Phone: (403) 422-2071

Saskatchewan

L. Lechner
Saskatchewan Environment
3085 Albert Street
Regina, Saskatchewan
S4S 0B1
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Affairs & Environment
Box 7, Building 2
139 Tuxedo Avenue
Winnipeg, Manitoba
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Ontario

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Acidic Precipitation in Ontario Study
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Ste. Foy, Québec
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Prince Edward Island

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Department of Community Affairs
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Charlottetown, Prince Edward Island
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Phone: (902) 892-0311

Newfoundland

L. Hulett,
Industrial Environmental Engineering
Division
Newfoundland Environment
P.O. Box 4750
Elizabeth Towers
Elizabeth Avenue
St. John's, Newfoundland
A1C 5T7
Phone: (709) 576-2555

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SECTION 1

ATMOSPHERIC RESEARCH

LRTAP PROJECT DESCRIPTIONTITLE

Sources and Emissions Inventories

PRINCIPAL INVESTIGATOR

NAME: Mr. R.P. Angle

PHONE: (403) 427-5893

AGENCY AND DEPARTMENT: Alberta Environment
Pollution Control Division

ADDRESS: 6th Floor Oxbridge Place
9820 - 106th Street
Edmonton, Alberta

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Industrial emissions alternate years; urban emissions every five years

APPROXIMATE COST PER YEAR: \$8,000 for industrial emissions urban emissions inventory \$ 70,000

PROJECT OBJECTIVES/DESCRIPTION:

An inventory of oxides of nitrogen (NO_x) and sulphur dioxide emission sources in Alberta are compiled every two years. Emission totals, both observed and licenced, for individual plants and industrial groups are included along with observed trends. An inventory of urban emissions sources are compiled every five years.

LRTAP PROJECT DESCRIPTION

TITLE

SO_x and NO_x Emissions Inventory for Saskatchewan, 1983

PRINCIPAL INVESTIGATOR

NAME: Mr. Larry Lechner

PHONE: (306) 787-6195

AGENCY DEPARTMENT: Saskatchewan Environment

ADDRESS: 3085 Albert Street
Regina, Saskatchewan
S4S 0B1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 6 months - June to November 1985

APPROXIMATE COST PER YEAR: \$5,000

PROJECT OBJECTIVES/DESCRIPTION

-Prepare an inventory on anthropogenic sources and emissions of sulphur and nitrogen oxides for 1983.

- Methods:
- a) Questionnaires (in-house) for any available information
 - b) Personal communications
 - c) Emission factors

LRTAP PROJECT DESCRIPTIONTITLE

1980 Ontario Volatile Organic Compounds Emission Inventory

PRINCIPAL INVESTIGATOR

NAME: Dave Yap
Frank Vena

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT

Joint venture between Ontario Ministry of the
Environment Canada

ADDRESS:

Ontario Ministry of the Environment
Air Resources Branch
880 Bay Street
Toronto, Ontario
M5S 1Z8

Environment Canada
Environmental Protection
Service
Program Management Branch
Ottawa, Ontario
K1A 1C8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

The Environmental Applications Group Limited
Rick Kolomaychuk and Gilles Castonguay

DURATION: 15 months

APPROXIMATE COST PER YEAR:xe \$120,000

PROJECT OBJECTIVES/DESCRIPTION

The objective is to develop a VOC emission inventory for the province of Ontario with a high spatial resolution and for several VOC compound classes. The study will more specifically supply hourly gridded emissions data with a spatial resolution of up to 5(km)² for 10 VOC reactivity classes for a full diurnal cycle in each season. This inventory will then serve as an input to the Eulerian Model which will be used to investigate possible control measures for reducing acid rain and for the control of oxidants.

LRTAP PROJECT DESCRIPTION

TITLE

Emission Inventory of Acid Rain Related Pollutants for Ontario and North America

PRINCIPAL INVESTIGATOR

NAME: David Yap

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment Air Resources Branch

ADDRESS: 880 Bay Street
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION:xe On-Going

APPROXIMATE COST PER YEAR: \$140,000

PROJECT OBJECTIVES/DESCRIPTION

1. To compile the most up-to-date acid rain related pollutant emission data (both natural and anthropogenic) for Ontario and North America.
2. To provide good quality emission data for input to the long range transport/acid rain modelling activities.
3. To provide accurate emission information for decision-making purposes.
4. To monitor the trend of acid rain related emissions in Ontario and North America.
5. To compile emission inventories for ammonia, alkaline dust-related substances and trace metals.
6. To estimate NO_x and HC emissions from a typical Ontario car population.

DESCRIPTION DU PROJET DE TADPA

TITRE

Mise à jour des émissions de polluants précurseurs (SO₂, NO_x) et projections pour 1990

NOM DU CHERCHEUR RESPONSABLE: Reynald Brullotte PHONE: (418) 643-5559

MINISTRE, ORGANISME OU SERVICE: Direction de l'assainissement de l'air,
(MENVIQ)

ADRESSE: 2360, chemin Sainte-Foy
Sainte-Foy, Québec
G1V 4H2

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S):

DURÉE DE CHAQUE PHASE: Phase 1, 2 et 3: 1985

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Identifier les sources et quantifier les émissions de polluants précipitations acides (SO₂, NO_x).

Phase 1 - Evaluer les émissions provenant de sources fixes comme les foyers de combustion et les procédés industriels.

Phase 2 - Evaluer les émissions provenant de sources mobiles comme les véhicules mûs à l'essence.

Phase 3 - Estimer les émissions de ces polluants pour l'année 1990.

LRTAP PROJECT DESCRIPTIONTITLE

Sulphur Dioxide and Nitrogen Oxide Emissions Data Base for Recent Years

PRINCIPAL INVESTIGATOR

NAME: Frank Vena

PHONE: (819) 994-3127

AGENCY AND DEPARTMENT: Environment Canada
Program Management Branch

ADDRESS: Environment Canada
Environmental Protection Service
Program Management Branch
Ottawa, Ontario K1A 1C8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 6 months (initial set-up)
On-going activity for data collection

APPROXIMATE COST PER YEAR: \$ 4,000

PROJECT OBJECTIVES/DESCRIPTION

The database was designed to maintain up-to-date emissions information on SO₂ and NO_x required for acid rain related studies. The information will be updated on an annual basis and accounts for approximately 90 percent of the total SO₂ and NO_x emissions in Canada.

LRTAP PROJECT DESCRIPTIONTITLE

Determination of Temporal Factors for 1980 National Anthropogenic Area Source Emissions

PRINCIPAL INVESTIGATOR

NAME: Anthony Kosteltz

PHONE: (819) 994-3064

AGENCY AND DEPARTMENT: Environment Canada
Program Management Branch

ADDRESS: Environment Canada
Environmental Protection Service
Program Management Branch
Ottawa, Ontario K1A 1C8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 4 months

APPROXIMATE COST PER YEAR: \$ 40,000

PROJECT OBJECTIVES/DESCRIPTION

The objective is to generate temporal profiles of emissions by sector or subsector for each 4° latitude zone within each province. For emissions governed by meteorological conditions, appropriate algorithms will be developed that will permit the calculation of hourly emissions based on the prevailing meteorology. The average annual gridded emissions can then be resolved into hourly time periods which is consistent with the requirements of the Eulerian Model.

LRTAP PROJECT DESCRIPTIONTITLE

Airborne Pollution Measurement and Trajectory Analysis

PRINCIPAL INVESTIGATOR

NAME: Ms. B. Magill

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT:

Alberta Environment
Research Management Division
14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. M. English
Atmospheric Sciences Department
Alberta Research Council
Edmonton, Alberta

DURATION: 1982- 1985

APPROXIMATE COST PER YEAR: \$ 50,000

PROJECT OBJECTIVES/DESCRIPTION

This project investigates the dispersion and transport of acid forming emissions from point source plumes near Fort McMurray in the oil sands area of northeastern Alberta. The chemical transformation and removal rate of sulphur dioxide and oxides of nitrogen from the atmosphere by both clouds and precipitation will be determined.

LRTAP PROJECT DESCRIPTIONTITLE

An Air Mass Back Trajectory and Event Precipitation Chemistry Analysis within Northern Saskatchewan

PRINCIPAL INVESTIGATOR

NAME: S.R. Shewchuk

PHONE: (306) 664-5437

AGENCY AND DEPARTMENT: Saskatchewan Research Council

ADDRESS: 30 Campus Drive
Saskatoon, Saskatchewan

COOPERATIVE AGENCIES Saskatchewan Environment
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1984

APPROXIMATE COST PER YEAR : N/A

PROJECT OBJECTIVES/DESCRIPTION

To explain rain chemistry results taken from an "event" network with mesoscale synoptic phenomenon. Air mass characteristics and source receptor relationships.

LRTAP PROJECT DESCRIPTION

TITLE

Ontario Regional LRTAP Studies

PRINCIPAL INVESTIGATOR

NAME: T. Allsopp

PHONE: (416) 973-5554

AGENCY AND DEPARTMENT: Atmospheric Environment Service
Ontario Region

ADDRESS: 25 St. Clair Avenue E.
Toronto, Ontario
M4T 1M2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

S. Bhartendu, Ontario Region AES
L.A. Barrie, AES
P.W. Summers AES

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$500 - \$1,000

PROJECT OBJECTIVES/DESCRIPTION

Meteorological conditions associated with high deposition episodes in Ontario are analyzed, as well as source-receptor relationships for these episodes using air trajectory modelling. The case study of 1982 APN data at Chalk River is extended to include other Ontario stations and years of data available. High episodes of SO₄, NO₃, and H⁺ concentrations are evaluated and air parcel trajectories computed. Summary documentation of these episodes are compiled.

LRTAP PROJECT DESCRIPTIONTITLE

Meteorological Studies of Acidic Precipitation in Ontario

PRINCIPAL INVESTIGATOR

NAME: David Yap

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch

ADDRESS: 800 Bay Street
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: On-Going

APPROXIMATE COST PER YEAR: \$100,000

PROJECT OBJECTIVES/DESCRIPTION

1. To provide meteorological support for modelling and field studies and for the interpretation of deposition monitoring data.
2. To provide meteorological advice.
3. To acquire and archive meteorological data to provide necessary input for modelling activities, meteorological studies and historical trend analyses.

LRTAP PROJECT DESCRIPTION

TITLE

Quebec Regional LRTAP Studies

PRINCIPAL INVESTIGATOR

NAME: R. Lawrence, P. Dubreuil

PHONE: (514) 283-1106

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: Quebec Region
100 Alexis Nihon Blvd - 3rd Floor
Ville St-Laurent, Quebec
H4M 2N8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

G. Desautels, R. Gilbert, Quebec Region
Atmospheric Environment Service

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$1,000 - \$1,500

PROJECT OBJECTIVES/DESCRIPTION

Data from the Acid Rain Report program is archived on the regional HP computer and analyzed for trends and possible weaknesses. Daily pH data from 6 CAPMON stations participating in the program and corresponding air mass trajectories are evaluated. Seasonal and annual summary reports are prepared, including statistical analyses.

Measurements of pH on shorter space and time scales are examined to improve air mass source region identification and detection of variability in acidity levels. Automated pH measurements are evaluated.

DESCRIPTION DU PROJET DE TADPA

TITRE

La relation entre l'acidité de la précipitation et des variables météorologique dont les retrotrajectories des masses d'air

NOM DU CHERCHEUR RESPONSABLE: Bhawan Singh

PHONE: (514) 270-3443

MINISTRE, ORGANISME OU SERVICE: Université de Montréal
Département de Géographie

ADRESSE: Case Postale 6128, Succ. "A"
Montreal, Québec
H3C 3J7

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S):

DURÉE DE CHAQUE PHASE: 3 ans

COÛT APPROXIMATIF (PAR ANNÉE): \$ 15,000

OBJECTIFS DU PROJET ET DESCRIPTION

LRTAP PROJECT DESCRIPTION

TITLE

Western Atlantic Ocean Experiment (WATOX)

PRINCIPAL INVESTIGATOR

NAME : D.M. Whelpdale

PHONE : (416) 667-4903

AGENCY AND DEPARTMENT : Atmospheric Environment Service

ADDRESS : 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

J.N. Galloway, U. of Virginia; J.M. Miller, NOAA;
T. Church, U of Delaware; A. Knap, Bermuda Biological
Station.

DURATION : 3 years, 1985/86 - 1987/88.

APPROXIMATE COST PER YEAR : \$30,000

PROJECT OBJECTIVES/DESCRIPTION

The fate of pollutants carried over the Atlantic Ocean from North America are determined using aircraft, ship and ground measurements.

The concentration, deposition and horizontal flux with distance over the North Atlantic are obtained for S, N, metals and organics. In the longer-term, WATOX will become part of the Global Tropospheric Chemistry Program (GTCP).

LRTAP PROJECT DESCRIPTION

TITLE

Precipitation Scavenging

PRINCIPAL INVESTIGATOR

NAME: Dr. L.A. Barrie

PHONE: (416) 667-4785

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Ontario Ministry of the Environment
University of Toronto

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$5,000 - \$15,000

PROJECT OBJECTIVES/DESCRIPTION

To investigate precipitation scavenging processes, both theoretically and experimentally and the relationships between airborne concentration and size distribution of metals and their concentrations in precipitation.

Simultaneous aerosol and precipitation samples are collected and analyzed giving a time-series of metal concentrations in air and precipitation. The data are used to test whether in-cloud conversion of SO₂ and NO₂ can be resolved from a detailed scavenging ratio analysis.

LRTAP PROJECT DESCRIPTIONTITLE

Cloud Chemistry Studies

PRINCIPAL INVESTIGATOR

NAME: G.A. Isaac

PHONE: (416) 667-4683

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)

National Aeronautical Establishment of NRC;
Ontario Ministry of Environment; Several U.S.
Agencies. Canada Centre for Remote Sensing

DURATION: Ongoing

APPROXIMATE COST PER YEAR: Undetermined

PROJECT OBJECTIVES/DESCRIPTION

To obtain a better understanding of chemical and physical processes and the pathways by which atmospheric pollutants contribute to acid precipitation and deposition and in general, to examine the role and mechanisms of clouds and precipitation in LRTAP.

Detailed analyses of air chemistry, cloud water and precipitation data obtained during major field studies data involving aircraft flights and ground-based observations are evaluated. Other field studies, cloud chemistry modelling and climatology studies are carried out cooperatively with universities and other federal and U.S. agencies.

Understanding of the mechanisms and rates of removal of pollutants by clouds and precipitation, oxidation of acid precursor pollutants in clouds and precipitation, and the redistribution of pollutants through the troposphere by both precipitating and non-precipitating convection clouds are the raison d'etre.

LRTAP PROJECT DESCRIPTION

TITLE

Atmospheric Chemical Processes

PRINCIPAL INVESTIGATOR

NAME: K.G. Anlauf

PHONE: (416) 667-4794

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

H.A. Wiebe, J. Bottenheim, R. Mickle, R. Hoff, AES;
H. Schiff, D. Hastie, York University;
G. Mackay, J. Harris, Unisearch.

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$250,000 - \$300,000

PROJECT OBJECTIVES/DESCRIPTION

Through field measurement studies, instrument research and development and modelling using field data, the following are examined:

- i) oxidant chemistry, in particular the nitrogen budget and influence of hydrogen peroxide and hydrocarbons (CH_2O),
- ii) relationship between nitric acid and aerosol NO_3 ,
- iii) influence of NH_3 on atmospheric acidic NO_3 and SO_4 , and iv) influence of night-time inversions on ground-level concentrations.

As well, the effects of the long-range transport of pollutants on nitrogen chemistry are examined at a rural site in Kejimikujik, N.S. and the measurement and assessment of the ozone burden on Canadian forests are tentatively planned at five sites in eastern Canada.

LRTAP PROJECT DESCRIPTIONTITLE

The Chemistry of High Elevation Fog (CHEF)

PRINCIPAL INVESTIGATOR

NAME: R.S. Schemenauer

PHONE: (416) 667-4684

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: Atmospheric Processes Research Branch
4905 Dufferin Street,
Downsview, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

G. Robitaille, CFS, V. Mohen, SUNY, Albany
P. Schuepp, McGill University
G. Paquette, McGill University
U.S. EPA

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$170,000 - \$300,000

PROJECT OBJECTIVES/DESCRIPTION

The US EPA has funded an extensive research project, The Mountain Cloud Chemistry Project (MCCP) to investigate mountain cloud chemistry/forest exposure at a series of sites along the Appalachian chain in the eastern U.S. The Canadian portion of this project is titled CHEF (Chemistry of High Elevation Fog). The data from the sites are analyzed by the groups involved, published and forwarded to CFS, universities and other users.

The scientific objectives are:

- i) to provide air chemistry and meteorological support to studies of the effects of atmospheric deposition on higher elevation forests in eastern Canada, and
- ii) to monitor selected air pollutants and the concentrations of pollution related ions in cloud water, over an extended period of time to estimate time-trends in such data.

Two observing sites at elevations of approx. 900 m are established this year at Mt. Tremblant and Roundtop Mtn. (Sutton). An initial set of six months of fog and rain pH measurements (summit/valley) has been obtained at the two sites and an automated IC (Ion Chromatograph) ordered for McGill U. Permission from Hydro Quebec has been obtained to set up research site at Montmorency (970 m). These three sites are to be fully operational for the May to September 1986 warm season MCCP field program. The CHEF program is being directed by AES with the field operations and chemical analysis being performed under contract by MacDonald College of McGill University.

The spatial and temporal variability of cloud water, fog and precipitation chemistry at the 1 km level in southern Quebec are reported. Data on the oxidant concentrations at 1 km and their variation with altitude are produced. Gaseous and particulate concentrations at 1 km within outside cloud are measured and reported. An important resultant effects study is the assessment of the change in health of high elevation forests over five years and its relation to pollutant inputs.

LRTAP PROJECT DESCRIPTION

TITLE

The Effect of Freezing on Cloud Droplets Composition

PRINCIPAL INVESTIGATOR

NAME: J. Iribarne

PHONE: (416) 978-5434

AGENCY AND DEPARTMENT: U. of T., Department of Physics

ADDRESS: 60 St. George St.
Toronto, Ontario
M5S 1A7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Funding Agency: Electric Power Research Institute

DURATION: 1½ year

APPROXIMATE COST PER YEAR: \$ 60,000

PROJECT OBJECTIVES/DESCRIPTION

The proposed research aims at obtaining some basic knowledge on the effect of freezing on the chemical composition of cloud drops (particularly during riming). The attention will be focused on the loss of acidity and of dissolved gases (such as SO₂) by the freezing out of volatile chemical species.

PROJECT NUMBER
20

SUBJECT CODE
1.3

LRTAP PROJECT DESCRIPTION

TITLE

The Role of Clouds and Precipitation in Long-Range Transport and Acid Rain in Canada

PRINCIPAL INVESTIGATOR

NAME: O.T. Melo

PHONE: (416) 231-4111

Ext. 6100

AGENCY AND DEPARTMENT: Ontario Hydro Research Division

ADDRESS: 800 Kipling Avenue
Toronto, Ontario
M8Z 5S4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

T.A. Kavassalis, Ontario Hydro
Y.T. Tam, Ontario Hydro
H.-R. Cho, University of Toronto
J.V. Irabarne, University of Toronto
Partially funded by CEA.

DURATION: 28 months (1985-1987)

APPROXIMATE COST PER YEAR: \$175,000

PROJECT OBJECTIVES/DESCRIPTION

To investigate the role of different cloud types in the production of and redistribution of acidic pollutants. The clouds to be investigated include cumulus clouds, stratiform clouds, frontal systems and rainbands embedded in stratiform clouds. Models are being developed for cloud dynamics, gas phase chemistry, aqueous phase chemistry and cloud microphysics.

LRTAP PROJECT DESCRIPTION

TITLE

A Critical Review of Nitro and Oxy PAH Compounds in the Atmosphere

PRINCIPAL INVESTIGATOR

NAME: P. Fellin

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT:

ADDRESS: Concord Scientific Corporation
2 Tippet Road
Downsview, Ontario
M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS

(IF APPLICABLE): Atmospheric Environment Service

DURATION: 6 months

APPROXIMATE COST PER YEAR: \$19,000

PROJECT OBJECTIVES/DESCRIPTION

A comprehensive review was conducted on the recent information on oxy- and nitro-substituted polynuclear aromatic hydrocarbons (PAH) in the atmosphere. The literature was surveyed for the years 1972 to 1984 and contacts were made with researchers active in the field. Information was reviewed pertaining to the toxicological properties of oxy- and nitro-PAH, the atmospheric pathways and fates of these compounds and on the rapid developments in the sampling and analytical methods. Some relevant physical properties of these compounds was summarized in appendices.

LRTAP PROJECT DESCRIPTIONTITLE

Provincial Acid Precipitation Monitoring Network, British Columbia

PRINCIPAL INVESTIGATOR

NAME: M.S. Kotturi

PHONE: (604) 387-4321

AGENCY AND DEPARTMENT: Ministry of Environment/Environmental Services
Section

ADDRESS: Environmental Services Section
Waste Management Branch
Ministry of Environment
Parliament Buildings
Victoria, B.C.
V8V 1X5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1983

APPROXIMATE COST PER YEAR: \$50,000

PROJECT OBJECTIVES/DESCRIPTION

The British Columbia Ministry of Environment operates seven stations to monitor wet deposition. Precipitation samples are collected using Sangamo Precipitation Collector, Type A. At six stations samples are collected on a weekly basis and at one station on a monthly basis. The latter sample is shared with AES. Samples analysed for ph, total acidity, alkalinity, SO₄, NO₃, Cl, NH₄, Na, K, Ca and Mg.

SUBJECT CODE
1.4

PROJECT NUMBER
23

LRTAP PROJECT DESCRIPTION

2.3.3-11

TITLE

Snow Sampling in British Columbia

PRINCIPAL INVESTIGATOR

NAME: M.S. Kotturi

PHONE: (604) 387-4321

AGENCY AND DEPARTMENT: Ministry of Environment/Environmental Services
Section

ADDRESS: Environmental Services Section
Waste Management Branch
Ministry of Environment
Parliament Buildings
Victoria, B.C.
V8V 1X5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 04/85 - 04/87

APPROXIMATE COST PER YEAR: \$ 5,000

PROJECT OBJECTIVES/DESCRIPTION

Snow core samples are taken once per year in British Columbia, at 16 sites. Samples analysed for pH, total acidity, alkalinity, SO₄, NO₃, Cl, F, NH₄, Na, K, Ca, Mg and Al.

LRTAP PROJECT DESCRIPTION

TITLE

Georgia Straits Wet Deposition Study

PRINCIPAL INVESTIGATOR

NAME: M.S. Kotturi

PHONE: (604) 387-4321

AGENCY AND DEPARTMENT: Ministry of Environment/Environmental Services
Section

ADDRESS: Environmental Services Section
Waste Management Branch
Ministry of Environment
Parliament Buildings
Victoria, B.C.
V8V 1X5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1984-1988

APPROXIMATE COST PER YEAR: \$62,000

PROJECT OBJECTIVES/DESCRIPTION

The British Columbia Ministry of Environment operates seven stations in Georgia Straits area to study the wet deposition of chemical species such as: SO₄; NO₃, Cl, K, Na, Ca, Mg, pH, total and strong acids.

LRTAP PROJECT DESCRIPTION

TITLE

Pacific Regional LRTAP Studies

PRINCIPAL INVESTIGATOR

NAME: D.A. Faulkner

PHONE: (604) 666-2184

AGENCY AND DEPARTMENT: Pacific Region , Atmospheric Environment Service

ADDRESS: 1200 W - 73rd, Avenue, Ste. 700
Vancouver, B.C.
V6P 6H9

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

R. McLaren, Pacific Region - AES
M. Still, Atmospheric Environment Service, Head Quarters
Toronto;
B.C. Provincial Agencies

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$25,000 - \$50,000

PROJECT OBJECTIVES/DESCRIPTION

Precipitation and air pollutants are monitored in B.C. in a manner consistent with the procedures and protocols used in the current CAPMON network in eastern Canada. Plans are in progress to expand the number of stations in cooperation with provincial agencies.

Measurements of atmospheric concentrations of PAH in Greater Vancouver are made at a number of sites, during varying weather/seasonal situations and compared with levels observed in other cities (toxic chemicals study with possible LRTAP implications).

LRTAP PROJECT DESCRIPTIONTITLE

Marine Sources of Acidity

PRINCIPAL INVESTIGATOR

NAME: G. A. McBean

PHONE: (604) 656-8448

AGENCY AND DEPARTMENT: Atmospheric Environment Service
Institute of Ocean Sciences (IOS), Sydney, B.C.

ADDRESS:

COOPERATIVE AGENCIES IOS, Sydney, British Columbia
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$30,000 (85/86)
\$15,000 (86/87, etc.)

PROJECT OBJECTIVES/DESCRIPTION

The scientific objectives are to assess the natural oceanic input into the atmosphere of sulphur and nitrogenous compounds, as well as organic acids, and to quantify and explain background acidity over the North Pacific area. Precipitation and aerosol samples are collected from IOS ship cruises followed by detailed laboratory analyses.

Studies to distinguish the natural production of volatiles from local sources are undertaken. Focus is on measurements and analyses leading to budget and modelling studies by 1989/90. Annual data reports, scientific papers and conference presentations are published.

LRTAP PROJECT DESCRIPTIONTITLE

Precipitation Quality Monitoring Network

PRINCIPAL INVESTIGATOR

NAME: Dr. Y. Lau

PHONE: (403) 427-5893

AGENCY AND DEPARTMENT: Alberta Environment
Pollution Control Division

ADDRESS: 6th Floor Oxbridge Place
9820 - 106th Street
Edmonton, Alberta

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Alberta Environment Centre
Bag 4000
Vegreville, Alberta

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$45,000

PROJECT OBJECTIVES/DESCRIPTION

The chemical composition of precipitation is monitored at several permanent sites in Alberta. The objective of the project is to detect significant changes resulting from industrialization within the province and to provide an historical data base.

LRTAP PROJECT DESCRIPTIONTITLE

Chemistry of Summer Precipitation in the Oil Sands Area of Northeastern Alberta

PRINCIPAL INVESTIGATOR

NAME: Ms. B. Magill

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division

ADDRESS: 14th Floor Standard Life Centre
Edmonton, Alberta T5J 3N4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

CHEMEX Labs Alberta (1984) Ltd.
2021 - 41 Avenue N.E.
Calgary, Alberta
T2E 6P2

DURATION: 1976 - ongoing

APPROXIMATE COST PER YEAR:PROJECT OBJECTIVES/DESCRIPTION

Rainfall is collected on an event basis in the oil sands area of northeastern Alberta to investigate the amount and distribution of pollutants of wetfall deposition. Objectives of the study are:

- 1) to quantify changes in the input rate of atmospheric trace substances
- 2) to establish a data base for the identification of trends in the chemical composition of the precipitation
- 3) to monitor the level of background pollutants

LRTAP PROJECT DESCRIPTIONTITLE

Chemistry of Winter Precipitation in the Oil Sands Area of Northeastern Alberta

PRINCIPAL INVESTIGATOR

NAME: Ms. B. Magill

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division

ADDRESS: 14th Floor Standard Life Centre
10405 - Jasper Avenue
T5J 3N4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

CHEMEX Labs Alberta (1984) Ltd.
2021 - 41 Avenue N.E.
Calgary, Alberta
T2E 6P2

DURATION: commenced in 1981 - ongoing

APPROXIMATE COST PER YEAR: \$15,000

PROJECT OBJECTIVES/DESCRIPTION

The accumulated snowpack in the AOSERP study area is being extensively sampled and chemically analyzed. The concentrations of the ionic and particulate constituents will be determined. Deposition patterns and spatial variability of snowpack loadings are studied to provide baseline data to assess the impact of future industrial development.

LRTAP PROJECT DESCRIPTION

TITLE

Evaluation, Analysis and Assessment of Snowpack and Precipitation Data from a Monitoring Network in the AOSERP AREA

PRINCIPAL INVESTIGATOR

NAME: Ms. B. Magill

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division

ADDRESS: 14th Floor Standard Life Centre
10405 - Jasper Avenue
T5J 3N4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Concord Scientific Corporation
2 Tippet Road
Downsview, Ontario

DURATION: 1984 - 1985

APPROXIMATE COST PER YEAR: \$40,000

PROJECT OBJECTIVES/DESCRIPTION

The data collected during the summer and winter precipitation chemistry projects will be subjected to stringent quality control criteria. The data will be evaluated statistically to determine:

1. relative contributions of local and distant sources to the chemical characterization of the precipitation
2. historic trends in deposition
3. the suitability of both field and laboratory procedures used.

LRTAP PROJECT DESCRIPTIONTITLE

Air Quality Data Acquisition

PRINCIPAL INVESTIGATOR

NAME: Ms. B. Magill

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT:

Alberta Environment
Research Management Division
14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Western Research
1313 - 41 Avenue N.E.
Calgary, Alberta

DURATION: 1983 - ongoing

APPROXIMATE COST PER YEAR: \$ 65,000

PROJECT OBJECTIVES/DESCRIPTION

An air quality monitoring station established in the vicinity of a biological monitoring plot near Fort McMurray in the oil sands region of northeastern Alberta. The station will measure on a continuous basis both meteorological data and ambient concentrations of acid forming gases which will be beneficial in assessing the response of terrestrial ecosystems to pollution episodes. The data atmospheric/air quality data to receptor response measurements.

LRTAP PROJECT DESCRIPTIONTITLE

Dry Deposition of Acid Forming Emissions in Alberta

PRINCIPAL INVESTIGATOR

NAME: Ms. B. Magill

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division

ADDRESS: 14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta T5J 3N4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

PROMET Environmental Group Ltd.
1338P - 36 Avenue N.E.
Calgary, Alberta

Western Research
1313 - 41 Avenue N.E.
Calgary, Alberta T2E 6L5

DURATION: 1983 - 1984

APPROXIMATE COST PER YEAR: \$70,000

PROJECT OBJECTIVES/DESCRIPTION

The project will continuously measure the ambient concentrations of sulphur dioxide during the growing season and collect integrated data on the quantity and quality of dry and wetfall particulate matter. The development and field testing of measurement techniques for the dry deposition of sulphur dioxide will be promoted, and the subsequent dry deposition velocities derived. The project will provide information necessary to assess the total sulphur deposition occurring in the vicinity of an Athabasca Oil Sands plant and define the source-receptor relationships.

LRTAP PROJECT DESCRIPTIONTITLE

Precipitation Monitoring Network, Northern Saskatchewan

PRINCIPAL INVESTIGATOR

NAME: Mr. Larry Lechner

PHONE : (306) 787-6195

AGENCY AND DEPARTMENT: Saskatchewan Environment

ADDRESS: 3085 Albert Street
Regina, Saskatchewan
S4S 0B1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Saskatchewan Research Council
Analytical Laboratory
30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1

DURATION: April 1 to October 31, each year

APPROXIMATE COST PER YEAR: \$20,000

PROJECT OBJECTIVES/DESCRIPTION

To monitor wet deposition on an event basis at 7 stations in Northern Saskatchewan.

METHOD : a) Collection of wet samples using a manual collector.

b) Samples collected on an event basis.

c) Sampling locations: Stoney Rapids
Pelican Narrows
Dreaver Lake
Kane Lake
Cree Lake
Cluff Lake
Lloyd Lake

LRTAP PROJECT DESCRIPTIONTITLE

Snowpack Chemistry Study of Small Lakes in Northern Saskatchewan

PRINCIPAL INVESTIGATOR

NAME: Larry Lechner

PHONE: (306) 787-6195

AGENCY AND DEPARTMENT: Saskatchewan Environment

ADDRESS: 3085 Albert Street
Regina, Saskatchewan
S4S 0B1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Environment Canada
Saskatchewan Research Council

DURATION: One snowpack sampling survey in March each year

APPROXIMATE COST PER YEAR: \$5,000

PROJECT OBJECTIVES/DESCRIPTION

To study the deposition and accumulation of chemical species including sulphate, nitrate, hydrogen ions and various metals in the snowpack in northern Saskatchewan.

- METHOD :
1. Collect snow core samples from a distribution of 7 small lakes (about 2 km² in size) in Northern Saskatchewan.
 2. Samples transported to laboratory in the frozen state and kept frozen until time of chemical analysis.
 3. Analyze samples for Cl⁻, SO₄⁼, NO₃⁻, NO₃⁻, pH, HCO₃⁻, CO₃⁼, cond., and heavy metals.

LRTAP PROJECT DESCRIPTIONTITLE

Origin of Strong Acidity in the Snowpack of Northern Saskatchewan

PRINCIPAL INVESTIGATOR

NAME: Dr. S.R. Shewchuk

PHONE: (306) 664-5437

AGENCY AND DEPARTMENT: Saskatchewan Research Council

ADDRESS: 30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Saskatchewan Environment

DURATION: One Year

APPROXIMATE COST PER YEAR: \$23,000

PROJECT OBJECTIVES/DESCRIPTION

To analyze and interpret snowpack chemistry data collected for northern Saskatchewan in 1984-85 to determine the nature and origin of strong acidity of the precipitation (sulphate and nitrate levels very low in northern Saskatchewan). Several possible scenarios are being explored:

- 1) the solution of mineral acids is in fact responsible for strong acidity.
- 2) natural organic acids may have significant contribution to the acidity.

LRTAP PROJECT DESCRIPTIONTITLE

Manitoba Network For Precipitation Collection (MNPC)

PRINCIPAL INVESTIGATOR

NAME: Mark Bennett/Tom Rae

PHONE: (204) 945-7097/8146

AGENCY AND DEPARTMENT: Environmental Management Division
Manitoba Dept. of Environment and Workplace Safety
and Health

ADDRESS: Box 7, Bldg. 2
139 Tuxedo Ave.,
Winnipeg, Manitoba
R3N 0H6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Atmospheric Environment Service
(Central Region)

DURATION: Commenced 1980 - ongoing

APPROXIMATE COST PER YEAR: \$50,000

PROJECT OBJECTIVES/DESCRIPTION

To quantify precipitation quality on a temporal and spatial basis within potentially sensitive areas of the Province.

Precipitation is sampled on a daily basis using MIC collectors at Norway House, Island Lake, Gillam, Brochet and Pointe du Bois. Samples are shipped weekly to the Provincial Technical Services Laboratory for analysis of pH, conductance, acidity, sulphate, nitrate, chloride, calcium, ammonium, magnesium, sodium and potassium. Both field and analytical data is electronically archived. Reports are available.

LRTAP PROJECT DESCRIPTION

TITLE

Monitoring of Acidic Deposition in The Manitoba Snowpack

PRINCIPAL INVESTIGATOR

NAME: F. Phillips, D. McEachern

PHONE: (204) 945-7003 (F.P.)
(204) 945-7061 (D. Mc)

AGENCY AND DEPARTMENT: Terrestrial Standards and Studies
Manitoba Dept. of Environment and Workplace Safety
and Health

ADDRESS: Bldg. 2
139 Tuxedo Ave.
Winnipeg, Manitoba
R3N 0H6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

W.M. Ward, Technical Services Laboratory,
Manitoba Dept. Environment & Workplace Safety & Health

DURATION: 1981 - ongoing

APPROXIMATE COST PER YEAR: \$16,200

PROJECT OBJECTIVES/DESCRIPTION

The province of Manitoba has been monitoring snow for the long range transport of air pollutants since 1981. Networks were initially established in close proximity to metallurgical smelters at Flin Flon and Thompson in northern Manitoba. Monitoring for air pollutant deposition includes heavy metals (Zn, Ni, Cu, Fe, Pb, Cd,) in addition to pH and sulphur.

Selected sampling sites throughout the boreal forest provide data on the long-range transport of air pollutants from surveys carried out in January, February and March for the period 1983 - 1985 inclusive. Results will include monitoring data on pH and acidity, SO₄, NO₃-NO₂-N, NH₃-N, Cl, Ca, Mg, Na, K for sites within close range of the northern mining smelters as well as sites located throughout the precambrian shield of the province of Manitoba.

LRTAP PROJECT DESCRIPTIONTITLE

Event Wet Deposition Network

PRINCIPAL INVESTIGATOR

NAME: Dr. Walter Chan

PHONE: (416) 965-1634

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Operation starting July 1980. On-going

APPROXIMATE COST PER YEAR: \$95,000 (4/85-3/86)

PROJECT OBJECTIVES/DESCRIPTION

1. To study the chemical composition, frequency and intensity of acidic precipitation episodes in the Province.
2. To determine in combination with trajectory analysis the acidic loading associated with air masses from different sectors.

The network consists of four sites (Dorset, London, Kingston and Atikokan areas) co-located with airborne particulate sampling trains. At each area, there are five samplers. The distance between two pairs of samplers is about 560-100 km and that between the two samplers within a pair is on the order of 10 km. The fifth sampler is co-located a few meters apart from one of the four others.

Precipitation sampling is carried out over a 24-hour period (0800-0800) using Aerochem Metrics wet-only samplers with polyethylene bags inserted into the samplers.

Samples are transferred to Toronto, MOE-LSB laboratory for chemical analysis (volume, conductivity, pH, total acidity, SO_4 , NO_3 , Cl, NH_4 , Ca, Na, K, Mg).

At some sites, Fisher Porter and Tipping bucket rain gauges and Nipher - shielded gauges are also in operation.

Data are entered into the MOE database, and after editing, will be transferred to NAQUADAT, SAROAD and MAP3S databases.

Ministry reports are issued to the public after internal review.

LRTAP PROJECT DESCRIPTIONTITLE

Cumulative Wet Deposition Network

PRINCIPAL INVESTIGATOR

NAME: Dr. Walter Chan

PHONE: (416) 965-1634

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Operation starting September 1980. On-going

APPROXIMATE COST PER YEAR: \$150,000(4/85-3/86)

PROJECT OBJECTIVES/DESCRIPTION

To establish the long term wet and dry deposition distribution patterns of acid, acid forming materials and trace metals across the province of Ontario.

- a) MOE-modified Sangamo type A, wet samplers are used in 36 background sites across Ontario.
- b) Polyethylene bags custom-made to fit the Sangamo bucket are used to collect precipitation samples separately over 4-week periods. Collection is made on Tuesday morning.
- c) In winter snow sampling, the container is modified to give a 4:1 height to diameter ratio to improve sampling efficiency.
- d) Storage gauges are used to measure precipitation depth.
- e) Samples are sent to the Toronto-MOE-LSB laboratory in polyethylene bags for chemical analysis (volume, conductivity, pH, total acidity, SO₄, NO₃, Cl, NH₄, Ca, Na, K, TKN, TP, Mg, Zn, Fe, Ni, Cu, Pb, Al; , Cd, Mn and V).

Data are entered into the MOE database, and after editing will be transferred to NAQUADAT in Ottawa, SAROAD in RTP (US EPA) and Brookhaven National Laboratory databases.

Ministry reports are issued to the public after internal review.

LRTAP PROJECT DESCRIPTIONTITLE

Airborne Particulate and SO₂ Sampling Network

PRINCIPAL INVESTIGATOR

NAME: Dr. Walter Chan

PHONE: (416) 965-1634

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch

ADDRESS: 800 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Operation from November 1981. On-going

APPROXIMATE COST PER YEAR: \$15,000(4/85-3/36)

PROJECT OBJECTIVES/DESCRIPTION

To determine long-term ambient concentration of various particulate and gaseous compounds.

Low volume sampling (2 l.p.m.) is carried out over 4-week intervals at 23 sites in Ontario.

The pre-filter is a Whatman 40 filter for particulate sampling and it is followed by a Nylon filter for HNO₃ sampling and a pair of W41 K₂CO₃- glycerol impregnated filters for trapping of SO₂.

Filters are submitted to MOE-LSB for chemical analysis. The W40 filter samples are analyzed for SO₄, NO₃, NH₄, major ions, nutrients, and trace metals; the Nylon and W41 filters are analyzed for HNO₃ and SO₂ respectively.

Data are entered into the MOE database, and after editing, will be deposited into NAQUADAT, SAROAD and MAP3S databases.

Ministry reports are issued to the public after internal review.

A review of the MOE data along with similar data obtained by Ontario Hydro and AES networks will be made periodically and a joint publication will hopefully result.

LRTAP PROJECT DESCRIPTIONTITLE

Particulate and Gaseous Sulphur and Nitrogen Compound Sampling Network

PRINCIPAL INVESTIGATOR

NAME: Dr. Walter Chan

PHONE: (416) 965-1634

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch

ADDRESS: 800 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES Ontario Hydro, Research Division - Mr. Melo
AND INVESTIGATORS
(IF APPLICABLE): Atmospheric Environment Service - Dr. L. Barrie

DURATION: Operation starting July 1980. Ongoing

APPROXIMATE COST PER YEAR: \$ 32,000 (April, 1985 - March, 1986)

PROJECT OBJECTIVES/DESCRIPTION

To measure particulate sulphate, nitrate and ammonium as well as gaseous SO₂ and HNO₃ on a daily basis (0800-0800).

The results of these measurements will be used to determine dry deposition rates associated with air masses having different sectors of origin, to support the interpretation of event precipitation, and to evaluate atmospheric reaction mechanisms associated with LRTAP.

At four sites, co-located with event precipitation collectors (Longwoods, Dorset, Charleston Lake and Fernberg), 47 mm low-volume filter packs (25 l.p.m.) are used at a 10 m height to collect samples daily as follows:

- particulates are collected on teflon pre-filters
- HNO₃ is collected on nylon filters
- SO₂ is collected on W-41 filters impregnated with potassium carbonate-glycerol solution
- analysis is carried out by the MOE-LSB in Toronto
- during the measurement program, field intercomparison studies of the network operation with OH and AES took place in January-April and July-October, 1981

LRTAP PROJECT DESCRIPTION

TITLE

Atmospheric Deposition in the Muskoka-Haliburton Area

PRINCIPAL INVESTIGATOR

NAME: Dr. P.J. Dillon

PHONE: (705) 766-2412

AGENCY AND DEPARTMENT: Water Resources Branch
Aquatic Ecosystems Section

ADDRESS: Dorset Research Centre
P.O. Box 39
Bellwood Acres Road
Dorset, Ontario
POA 1K0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 5 years

APPROXIMATE COST PER YEAR: \$ 80,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the input rates of strong acid, sulphate, nitrate, major ions and trace metals to lakes and watersheds in Muskoka-Haliburton.

Bulk deposition and "wet-only" deposition is measured at five sites. Meteorological information is also collected.

Long-term information on atmospheric deposition for use in mass balance modelling.

LRTAP PROJECT DESCRIPTION

TITLE

Oxidant Assessment
Ontario Data Base - Phase I

PRINCIPAL INVESTIGATOR

NAME: T. Dann, A/Chief

PHONE (613) 998-4705

AGENCY AND DEPARTMENT: Pollution Measurement Division
Environmental Protection Service
Environment Canada

ADDRESS: River Road Environmental Technology Centre
River Road
Ottawa, Ontario
K1A 1C8

COOPERATIVE AGENCIES Ontario Ministry of Environment
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: April 1985 - October 1985

APPROXIMATE COST PER YEAR: \$ 35,000

PROJECT OBJECTIVES/DESCRIPTION

To use the existing Ontario aerometric data base to improve understanding of the following issues: the frequency of occurrence of "elevated" ozone levels, the importance of local vs transported ozone in Ontario, the average and worst case impacts of ozone on crops, the relationships between ozone and sulphate and implications for health and crop loss impact assessment, urban/rural ozone distributions, and the effect of domestic NO_x and/or VOC control on ozone levels.

LRTAP PROJECT DESCRIPTION

TITLE

Turkey Lakes Basin Data Analysis

PRINCIPAL INVESTIGATOR

NAME: A. Sirois and R. Vet

PHONE: (416) 667-4797

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 4T5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): L.A. Barrie, W. Sukloff, AES;
Environment Conservation Service

DURATION: 2 years, 1985/86 -86/87

APPROXIMATE COST PER YEAR: \$ 10,000

PROJECT OBJECTIVES/DESCRIPTION

- Information on deposition to the Turkey Lakes Watershed is provide by;
- i) summarizing wet/dry deposition data obtained at the Algoma site for the period 1980-84 and by,
 - ii) comparing the Algoma data with two series of bulk samples obtained by ECS. Monthly dry deposition of SO₂ and NO₃- are obtained using the dry deposition rates calculated by Sirois and Voldner (1984) and the air concentration at Algoma. Monthly, seasonal and yearly wet and dry deposition are calculated and published.

LRTAP PROJECT DESCRIPTION

TITLE

Atikokan Air Quality and Meteorological Monitoring Program

PRINCIPAL INVESTIGATOR

NAME: A. Hoffer

PHONE: (416) 592-6308

AGENCY AND DEPARTMENT: Ontario Hydro
Environmental Studies & Assessments Department

ADDRESS: Ontario Hydro (H10 D2)
700 University Avenue
Toronto, Ontario
M5G 1X6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. H.D. Griffin
Chief, Air Quality Assessment
Ontario Ministry of the Environment - NW Region
P.O. Box 5000, Thunder Bay, Ontario, P7C 5G6
(807) 475-1215

DURATION: 3-year post-operational monitoring
(Following start up of Atikokan Generating Station - October 85)

APPROXIMATE COST PER YEAR : \$4,500

PROJECT OBJECTIVES/DESCRIPTION

- To determine wet deposition characteristics during operation of 200 MW Lignite-fired thermal generating station at Atikokan, Ontario.
- To determine effects of station operation on wet deposition chemistry and verify predicted effects in sensitive receptor areas.

Method: Sangamo - monthly cumulative wet deposition sampler.

Analyses for: SO_4^{2-} , NO_3^- , NH_4^+ , Ca^{2+} , Mg^{2+} ,

Na^+ , K^+ , Cl^- , pH, acidity, conductivity, volume.

Trace elements (to be done on a limited basis in the future) Zn, Fe, Ni, Cu, Pb, Al, Cd, Mn.

DESCRIPTION DU PROJET DE TADPA

TITRE

Evaluation du taux de dépôts acides

NOM DU CHERCHEUR RESPONSABLE: Ghislain Jacques PHONE : (418) 643-4588

MINISTRE, ORGANISME OU SERVICE: Service de la météorologie
Ministère de l'Environnement du
Québec, (MENVIQ)

ADRESSE : 2360, chemin Sainte-Foy
Sainte-Foy, Québec
G1V 4H2

COLLABORATEUR(S), Direction des relevés aquatiques, (MENVIQ)
ORGANISME(S) ET CHERCHEUR: Direction des Laboratoires, (MENVIQ)

DURÉE DE CHAQUE PHASE: Début 1980, sur une base continue

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Evaluer les taux de dépôts acides au Québec en mettant l'accent sur les régions sources et les zones sensibles à l'acidification.

Phase 1 - Opération des stations sur une base hebdomadaire.

Phase 2 - Analyse des ions majeurs des paramètres physico-chimiques reliés à l'acidification des précipitations.

Phase 3 - Traitement et interprétation des résultats.

DESCRIPTION DU PROJET DE TADPA

TITRE

Analyse de la variabilité spatiale des données chimiques de précipitations

NOM DU CHERCHEUR RESPONSABLE:

PHONE: (418) 657-2560

Jean-Pierre Villeneuve

MINISTRE, ORGANISME OU SERVICE: Institut national de la recherche
scientifique (INRS - Eau)

ADRESSE: 2700, rue Einstein
Sainte-Foy, Québec
G1V 4C7

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Direction de la météorologie (MENVIQ)
Direction des relevés aquatiques, (MENVIQ)

DURÉE DE CHAQUE PHASE: 1, 2, 3, 4, 5: entre janvier 1985 et mars 1986

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Faire l'analyse de la représentativité spatiale des données de concentrations et de dépôts des ions SO_4 , NO_x , NH_4 , Ca et du pH sur une base saisonnière par la méthode du "Krigage".

Phase 1 - Analyse des demi-variogrammes des concentrations et dépôts saisonniers des ions SO_4 , NO_x , NH_4 , et Ca pour les années 1982, 1983 et 1984.

Phase 2 - Analyse des demi-variogrammes de pH.

Phase 3 - Evaluation de l'erreur d'interpolation et d'intégration dans l'espace.

Phase 4 - Analyse du réseau actuel.

Phase 5 - Analyse de configuration modifiée du réseau.

NUMÉRO DE PROJET
48

CODE DU SUJET
1.4

DESCRIPTION DU PROJET DE TADPA

2.3.2

TITRE

Depôts secs des polluants gazeux

PRINCIPAL INVESTIGATOR

NAME: Conrad East

PHONE: (514) 282-3302

MINISTRE, ORGANISME OU SERVICE:

ADDRESS: Université du Québec à Montréal
Département de physique
C.P. 8888, Succ. A
Montréal, Québec
H3C 3P8

COLLABORATEUR(S)
ORGANISME(S) ET CHERCHEUR(S):

DURÉE DE CHAQUE PHASE:

COÛT APPROXIMATIF (PAR ANNÉE): \$ 5,000

OBJECTIFS DU PROJET ET DESCRIPTION

Mesure des transferts par turbulence des oxydes d'azote sur diverses surfaces. Cette mesure est effectuée par la méthode des profils, grâce à des sondes thermométriques, des anémomètres et des prises d'air (pour l'analyse du NO₂ par chimiluminescence) d'une tour météorologique située sur le terrain du Collège MacDonald, à Ste-Anne-de-Bellevue.

DESCRIPTION DU PROJET DE TADPA

TITRE

Étude des dépôts secs sur le couvert de neige

NOM DU CHERCHEUR RESPONSABLE: V. Delmas

PHONE: (418) 654-2524

MINISTRE, ORGANISME OU SERVICE: INRS-Eau (Institut national de la recherche scientifique)

ADRESSE: 2700, rue Einstein
C.P. 7500
Sainte-Foy, Québec
G1V 4C7

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): H.G. Jones (INRS-Eau)

DURÉE DE CHAQUE PHASE: 1983 - 1985 (Thèse de maîtrise)

COÛT APPROXIMATIF (PAR ANNÉE): \$ 25,000

OBJECTIFS DU PROJET ET DESCRIPTION

Évaluer la contribution des dépôts secs à la charge totale des polluants acides (H^+ , SO_4^{2-} , NO_3 , NH_4^+ , Cl^-) du couvert de neige avant la fonte printanière.

Méthode de travail:

Bassin du Lac Laflamme Québec. Études "in situ" des mesures de l'évolution qualitative du couvert de neige pendant des périodes de 1 à 5 jours. Études complémentaires de la qualité de l'air et les conditions météorologiques. Analyse statistique de variance et incorporation des résultats dans un modèle de dépôts secs.

Résultats prévus:

Détermination du taux dépôts secs de SO_4^{2-} , NO_3^- et NH_4^+ sur le couvert de neige.

DESCRIPTION DU PROJET DE TADPATITRE

Évolution physicochimique du couvert de neige

NOM DU CHERCHEUR RESPONSABLE: H.G. Jones

PHONE: (418) 654-2524

MINISTRE, ORGANISME OU SERVICE: INRS-Eau (Institut national de la recherche scientifique)

ADRESSE: 2700, rue Einstein
C.P. 7500
Sainte-Foy, Québec
G1V 4C7

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): W. Sochanska et C. Deblois (INRS-Eau); J. Stein
(Université Laval)

DURÉE DE CHAQUE PHASE: 1985 - 1987

COÛT APPROXIMATIF (PAR ANNÉE): \$ 50,000

OBJECTIFS DU PROJET ET DESCRIPTION

Déterminer les facteurs micro-météorologiques et physico-chimiques qui contrôlent la qualité du couvert de neige en périodes sans fonte et lors de la fonte printanière.

Méthode de travail:

Bassin du Lac Laflamme Québec; mesures (SO_4^{2-} , NO_3^- , Cl^- , H^+) en lieu forestier et couvert (station CAPMoN). Capteurs de précipitations Lysimètres des eaux de fonte, mesures micrométéorologiques. Etudes complémentaires du laboratoire sur la micro-structure physico-chimique des cristaux de neige et sur des simulateurs de fonte.

Résultats prévus:

Développement d'un modèle d'évolution de la charge totale des polluants acides dans le couvert de neige selon les conditions micrométéorologiques et physiques ambiantes.

LRTAP PROJECT DESCRIPTION

TITLE

The Chemical Dynamics of Seasonal Snowcovers

PRINCIPAL INVESTIGATOR

NAME: H. Gerald Jones

PHONE: (418) 654-2533

AGENCY AND DEPARTMENT: Institut national de la recherche scientifique
(Université de Québec)

ADDRESS: C.P. 7500
Ste. Foy, Québec
G1V 4C7

COOPERATIVE AGENCIES AND INVESTIGATORS (IF APPLICABLE): Jean Stein, Université de laval, Québec

DURATION: On-Going

APPROXIMATE COST PER YEAR: \$60,000

PROJECT OBJECTIVES/DESCRIPTION

The elucidation of the mechanisms responsible for the chemical evolution of seasonal snowcover (ex. dry deposition, photochemical oxidations, metamorphism) and their quantification with a view to develop predictive models of snowcover acidity under different meteorological and physical conditions. The study projects are limited primarily to seasonal snowcovers in forested or partially forested watersheds on the Canadian Shield.

LRTAP PROJECT DESCRIPTION

TITLE

Sampling and Analysis of Acid Fog

PRINCIPAL INVESTIGATOR

NAME: Peter H. Schuepp

PHONE: (514) 457-2000
Ext. 212

AGENCY AND DEPARTMENT: Dept. of Agr. Chemistry and Physics
Macdonald College of McGill University

ADDRESS: Lakeshore Rd. 21'111
Ste. Anne-de-Bellevue, Quebec
H9X 1C0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Atmospheric Environment Service (R. Schememauer)
G. Paquette, H.G. Leighton, A.R.C. Jones (McGill Univ.)

DURATION: Not determined

APPROXIMATE COST PER YEAR: at present: \$16,000 subvention
\$37,000 contract

PROJECT OBJECTIVES/DESCRIPTION

- development and installation of passive and active samplers for acid fog in mountainous locations in Quebec.
- sampling and analysis of acid fog for anion- and cation-concentrations.
- evaluation of the role of foliage in post-deposition chemical change in acid fog, including the role of dry deposition on foliage before a fog event.
- estimation of collection efficiency of trees for warm and supercooled fog.
- rudimentary meteorological interpretation (airmass trajectory) of the findings.

LRTAP PROJECT DESCRIPTIONTITLE

Environment New Brunswick Precipitation Monitoring Network

PRINCIPAL INVESTIGATOR

NAME: Jane Tims

PHONE: (506) 453-2669

AGENCY AND DEPARTMENT: Environmental Services Branch
Environment New Brunswick

ADDRESS: P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1980 - indefinite

APPROXIMATE COST PER YEAR: \$ 25,000

PROJECT OBJECTIVES/DESCRIPTION

To monitor the quality of precipitation at locations in N.B. remote from local pollutant sources.

To assess the spacial and temporal variation in deposition and concentration of pollutants in precipitation.

3 Stations (Nictau, Harcourt, Frog Lake).

Monthly sampling following CAPMoN guidelines for pH, acidity, conductivity and a variety of cations, anions and metals.

LRTAP PROJECT DESCRIPTION

TITLE

Saint John Sulfate Deposition Study

PRINCIPAL INVESTIGATOR

NAME: Jim Knight

PHONE: (506) 453-2861

AGENCY AND DEPARTMENT: Pollution Control Branch
Environment New Brunswick

ADDRESS: P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Environmental Protection Service
and Atmospheric Environment Service

DURATION: 1984 - 1986

APPROXIMATE COST PER YEAR: \$ 65,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the relative contributions of local and distant sources to sulfate deposition in the vicinity of Saint John, New Brunswick.

Four event precipitation stations have been operating since August 1984 within 20 km of Saint John.

Precipitation samplers and co-located hi-vol air samplers measure a variety of parameters, including pH, acidity, alkalinity, conductivity, and variety of ions.

LRTAP PROJECT DESCRIPTIONTITLE

St. John's Deposition Study

PRINCIPAL INVESTIGATOR

NAME: R.G. Shaw

PHONE: (902) 426-9055

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
B2Y 4AZ

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Environment New Brunswick;
Environmental Protection Service - Atlantic Region

DURATION: 3 years, 1984/85 - 1986/87

APPROXIMATE COST PER YEAR: \$70,000 (AES component \$5,000)

PROJECT OBJECTIVES/DESCRIPTION

The objective is to determine the relative dposition of sulphur species from local and long-range source regions and to determine the fate of sulphur species emitted from the local source region.

In the joint ENB-EPS-AES study (August 1984 to April 1986) at Saint John, N.B., samples are collected by hi-vols at 8 locations in and around the city (50 km radius), co-located with Sangamo and rain event samplers. Theses are analyzed for TSP and sulphates on a 6-day cycle to determine patterns which may be related to an estimate of dry deposition. Rain samples are collected during each storm and rainfall amounts recorded. Analyses include pH, acidity, conductivity, SO₄, CL, NO₃, V, Al, Mg, Ca, Na, Mn, NH₄, K. A mesoscale C-D model, which estimates deposition patterns of S species, is verified. AES's primary role is that of scientific advisor and data interpretation.

LRTAP PROJECT DESCRIPTIONTITLE

Saint John Sulphate Deposition Study (Cooperative study)

PRINCIPAL INVESTIGATOR

NAME: J. Knight - New Brunswick, PHONE: (506) 453-2861
Department of Environment
J. Kozak - Environment Protection Service (902) 426-6132

AGENCY AND DEPARTMENT: EPS (Environment Canada)/Environment
New Brunswick

ADDRESS: 5th Floor, Queen Square NBDOE
45 Alderney Drive P.O. Box 6000
Dartmouth, N.S. Fredericton, N.B.
B2Y 2N6 E3B 5H1

COOPERATIVE AGENCIES Atmospheric Environment Service, Downsview
AND INVESTIGATORS R. Shaw
(IF APPLICABLE):

DURATION: 2 years - study was initiated in August 1984 to be completed August 1986.

APPROXIMATE COST PER YEAR: \$60,000 per year (salaries, O&M)
(approx. \$30,000 O&M provided by EPS)

PROJECT OBJECTIVES/DESCRIPTION

To assess the deposition of Sulfur species in the vicinity of the local sources and to determine their contributions relative to more distant source regions to sulfate secondary deposition. A objective is to determine the fate of sulfur species emitted from the local source region.

Network consists of four stations measuring event precipitation chemistry and high volume air samples (SO₄, NO₄, etc).

Trajectory analysis to be carried out by AES Downsview/Bedford.

LRTAP PROJECT DESCRIPTION

TITLE

Wet Deposition and Aerosol Sulphate Monitoring Network

PRINCIPAL INVESTIGATOR

NAME: J. Kozak/W. Moores

PHONE: (902) 426-6132

AGENCY AND DEPARTMENT: Environment Protection Service -
Environment Canada

ADDRESS: 5th Floor, Queen Square
45 Alderney Drive
Dartmouth, N.S.
B2Y 2N6

COOPERATIVE AGENCIES AES (Atlantic Region)
AND INVESTIGATORS PEI Department of Community Affairs
(IF APPLICABLE):

DURATION: 1978, for an indefinite period

APPROXIMATE COST PER YEAR: \$2,000 O&M (1985/86)

PROJECT OBJECTIVES/DESCRIPTION

Measurement of concentration of free hydrogen ion, SO_4^{2-} , Cl^- , NO_3^- , K^+ , Ca^{2+} , Mg^{2+} , Na^+ , and an estimation of annual loadings and relative contributions to acid precipitation by SO_4 and NO_3 emissions; measurement of aerosol sulphate levels at a rural site near Halifax, N.S.; partitioning of estimated loadings between local and distant sources in N.S. to assist in the development of local SO_2 control strategies.

Precipitation samples are collected on an event basis at two sites in Nova Scotia and one in Prince Edward Island using Sangamo wet-only samplers. particulate sulphate (high volume, 24 h) is collected on a Teflon-coated glass fibre filter and analyzed by ion chromatograph. All analyses are performed by EPS.

LRTAP PROJECT DESCRIPTION

TITLE

Precipitation Chemistry in Nova Scotia

PRINCIPAL INVESTIGATOR

NAME: J.K. Underwood, Ph.D.

PHONE: (902) 424-5300

AGENCY AND DEPARTMENT: Nova Scotia Department of the Environment

ADDRESS: P.O. Box 2107
Halifax, Nova Scotia
B3J 3B7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Continuing ... to assess effectiveness of Canada's 1994 30% objective.

APPROXIMATE COST PER YEAR: \$75,000 - laboratory and personnel costs

PROJECT OBJECTIVES/DESCRIPTION

Five Sangamo samplers continue (since 1978) to be maintained in rural locations of the province. Standard CANSAP parameters plus some heavy metals and nutrients. Some results (through 1984) will be discussed at the Muskoka Conference.

SUBJECT CODE
1.4

PROJECT NUMBER
59

LRTAP PROJECT DESCRIPTION

TITLE

Oxidants Monitoring Network

PRINCIPAL INVESTIGATOR

NAME: W. Moores

PHONE: (902) 426-6132

AGENCY AND DEPARTMENT: Environment Protection Service, Environment Canada

ADDRESS: 45 Alderley Drive
Dartmouth, N.S.
B2Y 2N6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Environment New Brunswick - J. Knight
Nova Scotia Dept. of Environment - C. Oldrieve

DURATION: Ongoing, permanent network

APPROXIMATE COST PER YEAR: \$2,000 O&M (1985/86)

PROJECT OBJECTIVES/DESCRIPTION

Measurement of ozone levels in the region to determine the extent of ozone episodes in the New Brunswick/Nova Scotia region and the extent of the contribution of long range transport to ozone episodes; preparation of a 1984 status report on the oxidants monitoring program in the region.

Ozone monitors are operated by Environmental Protection Service at four sites in Nova Scotia and one in New Brunswick.

LRTAP PROJECT DESCRIPTIONTITLE

Wet Deposition Sampling Network

PRINCIPAL INVESTIGATOR

NAME: B. Power

PHONE: (709) 772-5488

AGENCY AND DEPARTMENT: Environment Protection Service - Environment Canada

ADDRESS: P.O. Box 5037
St. John's, Nfld
A1C 5V3

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

sampling collection: Parks Canada and Transport Canada
sample analysis: Canadian Forestry Service

DURATION: 1981 for an indefinite period

APPROXIMATE COST PER YEAR: \$3,000 O&M (1984/85)

PROJECT OBJECTIVES/DESCRIPTION

Measurement of concentrations of free hydrogen ion, SO_4 , Cl^- , NO_3^- , K^+ , Ca^{2+} , Mg^{2+} , Na^+ , NH_4^- , and an estimation of the deposition of SO_4 , NO_3 , NH_4 and H^+ and their relative contribution to acid precipitation; data collected is used to augment that collected by the Nfld LRTAP Committee.

Precipitation samples are collected on a weekly basis using Sangamo wet-only samplers at Terra Nova National Park, Gros Morne National Park, and the St. Anthony Loran C station. Analyses are performed by the Canadian Forestry Service laboratory in St. John's.

LRTAP PROJECT DESCRIPTIONTITLE

Atlantic Regional LRTAP Studies

PRINCIPAL INVESTIGATOR

NAME: C.F. MacNeil and B.L. Taylor

PHONE: (902) 835-9534

AGENCY AND DEPARTMENT: Atmospheric Environment Service
Atlantic Region

ADDRESS: Atmospheric Environment Service
1496 Bedford Highway
Bedford, N.S.
B4A 1E5

COOPERATIVE AGENCIES AND INVESTIGATORS (IF APPLICABLE): D. Whelpdale, Atmospheric Environment Service, Toronto
R. Shaw, Atmospheric Environment Service, BIO, N.S.

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$1,000 - \$1,500

PROJECT OBJECTIVES/DESCRIPTION

Large precipitation events during 1979-1984 at Kejimikujik N.S. are identified and documented. Other CAPMON sites in Atlantic Region may undergo similar assessment.

Precipitation chemistry stations in Atlantic Region are evaluated based on an assessment and synthesis of precipitation chemistry data from regional and national networks since 1980.

An inventory of all Atlantic Region stations is prepared and updated.

A comprehensive annotated bibliography of all LRTAP literature produced in the region is compiled and updated.

An annual workshop is held to review federal, provincial and university projects and initiate new studies.

PROJECT NUMBER

62

SUBJECT CODE

1.4

LRTAP PROJECT DESCRIPTION**TITLE**

Canadian Air and Precipitation
Monitoring Network (CAPMoN)

PRINCIPAL INVESTIGATOR**NAME:** M.E. Still**PHONE:** (416) 667-4988**AGENCY AND DEPARTMENT:** Atmospheric Environment Service**ADDRESS:** 4905 Dufferin Street
Downsview, Ontario
M3H 5T4**COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):**

R. Vet , W. Sukloff, W. Kobelka, A. Gandenze, B. Martin,
A.W. Smith, Atmospheric Environment Service, Downsview;
AES Regional Offices

DURATION: Ongoing**APPROXIMATE COST PER YEAR:** \$840,000 - \$880,000**PROJECT OBJECTIVES/DESCRIPTION**

The CAPMON program objectives are:

- i) to monitor the concentration of ionic species in air and precipitation, in order to determine short-term and long-term spatial and temporal variations in deposition
- ii) to improve the operational capability of the network to achieve a high quality output, including upgrading as required, and
- iii) to assess the network as to its adequacy to detect changes in emissions

These are attained by measuring; i) precipitation daily at 22 sites and monthly at 26 sites (with daily sites increasing to 26 and monthly decreasing to 10 over the next 2 years), ii) air quality at 10 stations; by examining possible future sites (eg. NWT) for inclusion in the network; by managing and operating an ongoing QC/QA program; and by routine data publications, analyses reports and QC/QA assessment reports on the spatial and temporal variations in air and precipitation concentrations of acidic chemical species.

LRTAP PROJECT DESCRIPTION

TITLE

CAPMoN Dry Deposition Velocities

PRINCIPAL INVESTIGATOR

NAME: R. Vet

PHONE: (416) 667-4801

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 4T5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

G.B. Skelton, Technical Services Ltd., Bobcaygeon, Ont.;
W. Sukloff, Atmospheric Environment Service;
Inland Waters Directorate

DURATION: 85/86 - 86/87

APPROXIMATE COST PER YEAR: \$21,000 (85/86), \$1,000 (86/87)

PROJECT OBJECTIVES/DESCRIPTION

The dry deposition velocities and fluxes of APN- (Air and Precipitation Network, now part of CAPMoN) measured chemical species to snow surfaces are determined, as well as the accuracies of these determinations. Discrepancies in the snowpack and collector samples are also investigated. These are done by three daily and simultaneous snow core, wet deposition and air filter measurement at a site on the Canadian shield for SO_4^{2-} , NO_3^- , NH_4^+ , SO_2 , Na^+ , Cl^- , and K^+ . Data analysis include multiple linear regression and error analyses. Newly fallen snow pack samples are taken to determine the significance of discrepancies between snow pack composition and precipitation samples in collectors.

PROJECT NUMBER
64

SUBJECT CODE
1.4

LRTAP PROJECT DESCRIPTION

TITLE

U.S. National Trends Network (NTN) U.S. National Atmospheric Deposition Program (NADP)/Canadian Air & Precipitation Monitoring (CAPMoN) Intercomparison Study

PRINCIPAL INVESTIGATOR

NAME: M. Still

PHONE: (416) 667-4988

AGENCY AND DEPARTMENT: Atmospheric Environment Service/Environment Canada

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 4T5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): R. Vet, AES;
U.S.A. EPA (NAPAP)

DURATION: 2 years, 1985/86 - 86/87

APPROXIMATE COST PER YEAR: \$40,000 - \$50,000

PROJECT OBJECTIVES/DESCRIPTION

An intercomparison study between the National Trends Network (NTN), the U.S. National Network (NADP) and Canadian Air & Precipitation Monitoring Network (CAPMoN) determines whether differences exist, their magnitude and if corrections should be made when comparing data.

The design involves 6 sites (3 in each country), with 2 (1 in each country) for an intensive study. In Canada, the intensive study at Sutton involves 6 collectors (2 CAPMoN daily, 2 NTN daily and 2 NTN weekly). The other 2 sites have only 2 collectors (1 for each network).

A meeting in January 1986 will finalize study design.

SUBJECT CODE
1.4

PROJECT NUMBER
65

LRTAP PROJECT DESCRIPTION

TITLE

Acid Rain Report

PRINCIPAL INVESTIGATOR

NAME: M. Still

PHONE: (416) 667-4988

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 4T5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

R. Vet, AES;
Atlantic, Quebec and Ontario Regions, AES

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$15,000

PROJECT OBJECTIVES/DESCRIPTION

A review of the procedure and equipment, including the institution of a QC/QA program similar to CAPMoN, is planned. The pH of precipitation at six sites in Eastern Canada is report to the public on a near real time basis.

PROJECT NUMBER
66

SUBJECT CODE
1.4

LRTAP PROJECT DESCRIPTION

TITLE

Dry Deposition Studies

PRINCIPAL INVESTIGATOR

NAME: G. Edwards, G.L. Ogram, F. Northrup PHONE: (416) 231-4111

AGENCY AND DEPARTMENT: Ontario Hydro Research Division

ADDRESS: 800 Kipling Avenue
Toronto, Ontario
M8Z 5S4

COOPERATIVE AGENCIES Canadian Electrical Association
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: July 1, 1985 to December 31, 1987

APPROXIMATE COST PER YEAR: \$150,000

PROJECT OBJECTIVES/DESCRIPTION

To undertake the measurement of dry deposition fluxes over various surfaces typical of the Canadian terrain, using the tunable diode laser absorption spectrometer - based technique developed and tested in Phase I of the study. The technique developed allows measurements by eddy correlation of pollutant flux at one level above a surface and heat, water and momentum fluxes at three levels. Four intensive field programs will be undertaken over a 30-month period. Snow, forest and agricultural vegetation surfaces have been proposed for study. Study results will be used in the development of a mathematical model.

LRTAP PROJECT DESCRIPTION

TITLE

Dry Deposition of Air Pollution of Forests

PRINCIPAL INVESTIGATOR

NAME : G. den Hartog and H.H. Neumann

PHONE : (416) 667-4780

AGENCY AND DEPARTMENT : Atmospheric Environment Service

ADDRESS : 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION : Ongoing

APPROXIMATE COST PER YEAR : \$150,000 - \$200,000

PROJECT OBJECTIVES/DESCRIPTION

Atmospheric fluxes of gaseous and particulate pollutants to forests and other representative surfaces are measured at a forest research site in Ontario (Camp Borden).

Deposition rates are parameterized to provide inputs to pollutant transport and deposition models. Specifically, deposition velocities of ozone and SO₂ to a forest canopy, on a seasonal basis, are provided. Monthly loadings of sulphur and ozone to the canopy are also evaluated.

The deposition velocities to the forest as functions of mean wind, atmospheric stability and canopy state are determined and parameterized.

LRTAP PROJECT DESCRIPTION

TITLE

Data Analyses, Integration and Synthesis (DAIS)

PRINCIPAL INVESTIGATOR

NAME : P.W. Summers

PHONE : (416) 667-4796

AGENCY AND DEPARTMENT : Atmospheric Environment Service

ADDRESS : 4905 Dufferin Street
Downsview, Ontario
M3H 4T5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

L.A. Barrie, D. Whelpdale, A. Sirois, R. Vet,
K. Anlauf, A. Wiebe, J. Botlenheim, W. Fricke, K. Bryce,
Atmospheric Environment Service

DURATION : On-going

APPROXIMATE COST PER YEAR : \$50,000 - \$70,000

PROJECT OBJECTIVES/DESCRIPTION

DAIS will analyze, interpret and synthesize data, initially from the atmospheric sector (and gradually include others), and provided integrated information in a format useful to other research disciplines and to address specific policy issues. The inputs will be scientific results and data from various sources (incl. monitoring networks, field studies, processes research and LRT modelling) and a series of questions or issues posed by users of atmospheric information (eg. effects researchers, policy-makers).

Using modelling tools, statistical tests, meteorological stratifications and general empirical relationships to integrate and interpret results at a "higher level" than each individual research finding, an attempt will be made to answer these questions. Outputs will include specialized products synthesizing data from monitoring networks, empirical relationships between emissions/emission changes and observed air concentrations/wet deposition patterns; inputs to design of field programs and monitoring networks and finally interpretation of observations to serve policy issues. The main outputs will be published journal papers and input to assessment reports.

SUBJECT CODE
1.4

PROJECT NUMBER
69

LRTAP PROJECT DESCRIPTION

TITLE

Analysis of Samples from the CANASTA Program

PRINCIPAL INVESTIGATOR

NAME: P. Fellin

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT: CONCORD SCIENTIFIC CORPORATION
2 Tippet Road
Downsview, Ontario
Canada, M3H 2V2

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Atmospheric Environment Service

DURATION: 4 months

APPROXIMATE COST PER YEAR: \$28,000

PROJECT OBJECTIVES/DESCRIPTION

Analysis of over 2,000 precipitation samples obtained under the CANASTA program was conducted for major anion constituents and pH. The samples were obtained during the summer of 1984 using manual sampling techniques in three areas of Canada. These areas, Kejimikujik National Park in Nova Scotia, Mont Tremblant in Quebec and Dorset in Ontario, are areas severely impacted by acid precipitation and current locations of long-studies. Data produced in the analytical program are currently being evaluated at AES.

LRTAP PROJECT DESCRIPTIONTITLE

Aerosol Composition

PRINCIPAL INVESTIGATOR

NAME: L.A. Barrie

PHONE: (416) 667-4785

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

W. Sturges, Atmospheric Environment Service
Downsview, Ontario

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$20,000

PROJECT OBJECTIVES/DESCRIPTION

Aerosols are sampled at rural sites in eastern Canada to identify and quantify trace elements and other chemical compounds that dominate. In 1984, samples were collected from three locations; Kejimikujik, N.S., Ft. Montmorency, Quebec and Dorset, Ontario.

Short-term sampling studies continue at the latter site for lead isotopes. The usefulness of these isotopes as an indicator of lead (Pb) origin is examined. A report on trace elements and other compounds found in respirable, light scattering aerosols will be produced in 1986.

LRTAP PROJECT DESCRIPTIONTITLE

National Air Pollution Surveillance (NAPS) Network (O₃, SO₂, NO₂, Sulphate, Inhalable Particulates)

PRINCIPAL INVESTIGATOR

NAME: Paul Brunet, A/Head

PHONE: (613) 998-4705

AGENCY AND DEPARTMENT: Ambient Monitoring Section
Environmental Protection Service
Environment Canada
Pollution Measurement Division

ADDRESS: River Road Environmental Technology Centre
River Road
Ottawa, Ontario
K1A 1C8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

All Provincial Departments of Environment, Montreal Urban
Community and the Greater Vancouver Regional District

DURATION: ongoing. Some monitoring sites have been in operation since 1970.

APPROXIMATE COST PER YEAR: 5 PY, \$ 102,000

PROJECT OBJECTIVES/DESCRIPTION

Continuous measurements of SO₂ are made at 75 sites, of NO₂ at 50 sites and O₃ at 50 sites located in the major urban areas of Canada. Particulate sulphate measurements are made once every six days at 50 sites using high volume samples with low artifact filters. Fine, coarse and inhalable particulate (10um) measurements are available from 17 sites on a six day schedule. Multi-element analysis of selected fine and coarse filters is carried out for all sites. Monthly and annual data reports are published.

LRTAP PROJECT DESCRIPTIONTITLE

Arctic Air Chemistry

PRINCIPAL INVESTIGATOR

NAME: L.A. Barrie

PHONE: (416) 667-4785

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 4T5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

M. Olson, W. Sturges, J. Kovalick,
K.K. Oikawa, J. Marks, AES

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$30,000 - \$50,000

PROJECT OBJECTIVES/DESCRIPTION

The overall objective is to understand the history, nature, occurrence, origin, chemical/physical transformation, effects and removal of pollutants in the Arctic troposphere.

Several activities are involved, including:

- i) Arctic sulphur budget determination using chemical transport model,
- ii) establishment of long-term air pollutant monitoring program at Alert BAPMON site, including data analyses and interpretation,
- iii) investigation of aerosol/SO₂ occurrence, origin, removal during AGASP II (April 1986),
- vi) analysis of glacial ice collected in Polar Continental Shelf Project, and
- v) presentation of Canadian Arctic Air Chemistry Research on a visit to the Soviet the Union under the Canadian/U.S.S.R. agreement on co-operation in the Arctic.

SUBJECT CODE
1.4

PROJECT NUMBER
73

LRTAP PROJECT DESCRIPTION

TITLE

Arctic Haze (AGASP II)

PRINCIPAL INVESTIGATOR

NAME: N. Trivett

PHONE: (416) 667-4954

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario
M3H 4T5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

F. Fanaki, L. Barrie, J. Bottenhiem, G. den Hartog,
R. Hoff, R. Michle, (ARQD, AES); W. Evans (ARPX, AES);
R. Leaitch (AR,PP AES).

DURATION: To 1987

APPROXIMATE COST PER YEAR: \$50,000 - \$100,000

PROJECT OBJECTIVES/DESCRIPTION

The Arctic Haze Study is a major field program during March and April 1986, at Alert, in the High Arctic.

The composition and origin of the layers of haze in the arctic are determined and compared with surface-based measurements. The representativeness of the latter are evaluated under very stable conditions. The particulate concentrations and their size distribution are measured using an Anderson impactor to augment the data collected.

PROJECT NUMBER

74

SUBJECT CODE

1.4

LRTAP PROJECT DESCRIPTION

TITLE

Analysis of Artic Ice Core Samples

PRINCIPAL INVESTIGATOR

NAME: P. Fellin

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT:

ADDRESS: CONCORD SCIENTIFIC CORPORATION
2 Tippet Road
Downsview, Ontario
M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS

(IF APPLICABLE): Atmospheric Environment Services - Downsview

DURATION: 4 months

APPROXIMATE COST PER YEAR: \$ 6,000

PROJECT OBJECTIVES/DESCRIPTION

Methods were developed and tested for analysis of ice core samples for major ions and pH using ion chromatography and electrode techniques, respectively. The samples were obtained under pristine sampling conditions from a glacier in Northern Canada. Each core was segmented by year and analysis was to provide historical information related to pollution levels for primarily sulphates and pH but also for other major ions. The uniqueness of the sample is demonstrated by the fact that observed conductivity levels were often below 5 Siemens requiring the utilization of techniques with excellent sensitivity.

LRTAP PROJECT DESCRIPTIONTITLE

Statistical Analysis of Acid Precipitation Data

PRINCIPAL INVESTIGATOR

NAME: T. Jarv and S. Bartlett

PHONE: (416) 231-4111

AGENCY AND DEPARTMENT: Ontario Hydro Research Division

ADDRESS: 800 Kipling Ave.
Toronto, Ontario
M8Z 5S4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Ontario Hydro's Technical and Training Services Division

DURATION: 1985

APPROXIMATE COST PER YEAR: \$27,500

PROJECT OBJECTIVES/DESCRIPTION

To extend the analysis presented in a recent paper [Science 255, 407 (1984)] to Ontario and eastern Canada. In particular, the project consists of the following tasks: (a) assemble an appropriate acid precipitation data base for Ontario and neighbouring regions, (b) statistically analyze this data base in a way similar to that in the Science paper [i.e., structural regression, scatter plots and cluster analysis (factor analysis)], (c) compare the results from Ontario with those obtained in the U.S., (d) report the results of the comparison and provide recommendations for additional work.

PROJECT NUMBER

76

SUBJECT CODE

1.4

LRTAP PROJECT DESCRIPTION

TITLE

A Review of Atmospheric Deposition Networks in the Great Basin

PRINCIPAL INVESTIGATOR

NAME: P. Fellin

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT: CONCORD SCIENTIFIC CORPORATION

ADDRESS: 2 Tippet Road
Downsview, Ontario
Canada, M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

International Joint Commission

DURATION: 4 months

APPROXIMATE COST PER YEAR: \$19,000

PROJECT OBJECTIVES/DESCRIPTION

A review of air and precipitation sampling networks was conducted for networks operating in the Great Lakes Basin in the years 1976 to 1984. The review was conducted by performing a telephone and letter survey of active researchers in the Great Lakes area and by literature search techniques. The information for each network was summarized by type of compound monitored, i.e. major classifications were organic compounds, metals and major ions and by type of sampling, i.e. bulk deposition, wet precipitation collection, dry deposition techniques and air sampling techniques. The data were categorized in tabular form by network and agency and in maps by site and type of compound monitored. Brief comments were made on the suitability of siting, collection and analytical protocols and recommendations for a more comprehensive review of the data were conducted.

SUBJECT CODE
1.5

PROJECT NUMBER
77

LRTAP PROJECT DESCRIPTION

TITLE

Diffusion, Transport and Deposition Modelling for Point Source Emissions

PRINCIPAL INVESTIGATOR

NAME: Mr. R.P. Angle

PHONE: (403) 427-5893

AGENCY AND DEPARTMENT: Alberta Environment
Pollution Control Division

ADDRESS: 6th Floor Oxbridge Place
9820 - 106th Street
Edmonton, Alberta T5J 3N4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$40,000

PROJECT OBJECTIVES/DESCRIPTION

A set of models is maintained in order to estimate concentrations and deposition downwind of point sources. The level of input data determines the selection of the specific model to be used. New models are added as they become available and older ones are upgraded as required. Existing and proposed point sources and complexes of point sources are evaluated for regulatory purposes. Occasionally guide models are promulgated for general use.

PROJECT NUMBER

78

SUBJECT CODE

1.5

LRTAP PROJECT DESCRIPTION

TITLE

Western Regional LRTAP Studies

PRINCIPAL INVESTIGATOR

NAME: W.D. Hume

PHONE: (403) 420-3143

AGENCY AND DEPARTMENT: Western Region, Atmospheric Environment Service

ADDRESS: Argyll Centre
6325-103 Street
Edmonton, AB
T6H 5H6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

P. Kociuba, B. Thompson, Western Region, AES;
Dept. of Renewable Resources, GNWT;
Alberta Environment

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$15,000 - \$20,000

PROJECT OBJECTIVES/DESCRIPTION

Existing wind/trajectory models and data available on the AS6 are tested for their potential to produce regional-scale trajectories. By March 1987, a report on methodologies and recommendations for regional applications will be produced.

Precipitation chemistry is sampled at 4 sites in the NWT following CAPMoN procedures and protocol.

Estimates of sulphur loading in western Canada using LRT statistical models are made. Implementations of the models on the AS/6 computer are planned.

A cooperative program to upgrade and monitor regional wet deposition in Western Region, including the Yukon is planned.

SUBJECT CODE
1.5

PROJECT NUMBER
79

LRTAP PROJECT DESCRIPTION

TITLE

Modelling of the Deposition of Selection in Species to the Environment with a Radius of 100 km of the Metal Smelter at Flin Flon

PRINCIPAL INVESTIGATOR

NAME: S.R. Shewchuk

PHONE: (306) 664-5437

AGENCY AND DEPARTMENT: Saskatchewan Research Council

ADDRESS: 30 Campus Drive
Saskatoon, Saskatchewan

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985

APPROXIMATE COST PER YEAR: N/A

PROJECT OBJECTIVES/DESCRIPTION

To explain the observed distributions of depositions of various major ions and metals to the environment near the smelter. Major air quality deposition models were used in this study. A significant network of ground truthing sites allowed good statistical verification of the deposition patterns.

PROJECT NUMBER
80

SUBJECT CODE
1.5

LRTAP PROJECT DESCRIPTION

TITLE

Development of Puff Trajectory Statistics for 1978-80

PRINCIPAL INVESTIGATOR

NAME: Contractor - Concord Scientific
Project Officer - B. Ley

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1983-84

APPROXIMATE COST PER YEAR: \$95,000

PROJECT OBJECTIVES/DESCRIPTION

Mean sea-level pressure data from surface stations and model analysis over the oceans were used to calculate the geostrophic wind field at 3 hr intervals over the period January 1, 1978 to December 31, 1980. Using these wind fields, trajectories were initiated every 3 hrs at 60 sites across eastern North America. Each trajectory was followed for 96 hrs or until it left the model domain.

The statistics of the trajectory end points at a given travel time (3 through 96 hrs) were calculated for each month, season and year for the study period. Also SO₂ and SO₄ mass weighted trajectory end point statistics were developed for the same time period.

LRTAP PROJECT DESCRIPTION

TITLE

Development of the Statistical Model of Long Range Transport

PRINCIPAL INVESTIGATOR

NAME: A. Venkatram (B. Ley)

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1979-80 (completed)

APPROXIMATE COST PER YEAR: \$30,000

PROJECT OBJECTIVES/DESCRIPTION

Develop a model of the long range transport and deposition of sulphur oxides which by design is simple and inexpensive (in computer resources) to apply.

The model parameterizes the transport and deposition of SO_2 and SO_4 in terms of climatological statistics. The model includes two principle modules describing linear chemistry with wet and dry deposition and describing pollutant transport. A unique feature of this model is the treatment of the wet and dry periods encountered by the pollutant as it is transported (See Venkatram et al., Atmos Envir. 16, pp. 249-257 (1981) for details). Emissions from point sources (or area emissions treated as point sources) located over all of North America east of the Rocky Mountains are included in the model simulations. This model has been evaluated with 1977, 1978 and 1980 annual wet deposition measurements. Reasonable correspondence between model results and measurements was found.

LRTAP PROJECT DESCRIPTION

TITLE

Sensitivity Testing of the Statistical Model

PRINCIPAL INVESTIGATOR

NAME: B. Ley, P.K. Misra

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1980-81

APPROXIMATE COST PER YEAR: \$15,000

PROJECT OBJECTIVES/DESCRIPTION

A series of statistical model calculations were undertaken to assess the sensitivity of the model predictions to the values selected for the various model parameters including: the dry and wet deposition rates for SO₂ and SO₄, the conversion rate for SO₂ to SO₄ during wet and during dry periods, the duration of wet and dry periods in the Lagrangian and Eulerian frameworks, the boundary layer height, and the horizontal transport and dispersion parameters.

The sensitivity of the model calculation of wet deposition to the vertical dispersion of emissions relative to the boundary layer height was tested by reformulating the model as a two layer model with a probability emissions move between layers.

The model was determined to be most sensitive to the transport and SO₂ wet deposition parameters.

LRTAP PROJECT DESCRIPTIONTITLE

Application of the Statistical Model for Special Studies

PRINCIPAL INVESTIGATOR

NAME: B. Ley, S. Wong, P.K. Misra

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATIONS
(IF APPLICABLE):

DURATION: 1981-85

APPROXIMATE COST PER YEAR: \$25,000

PROJECT OBJECTIVES/DESCRIPTION

The Ontario Ministry of Environment Statistical Model of the long range transport and deposition of sulphur oxides has been employed for several special studies including:

- a) as part of the Sudbury Environmental Study, the relative contribution of the SO₂ emissions by INCO and Falconbridge to wet sulphate deposition in northeastern North America was calculated for various projected emissions amounts
- b) as part of the US-Canada Memorandum of Intent, the model calculations of sulphate air concentrations and wet sulphate deposition were evaluated and the model was employed to calculate source to receptor transfer coefficients
- c) model assessment of various proposed SO₂ emission changes for specific sources or source groups.

LRTAP PROJECT DESCRIPTION

TITLE

Lagrangian Model Study of the Relative Role of Emissions and Meteorological Variability in Variation in Wet Deposition of Sulphate

PRINCIPAL INVESTIGATOR

NAME: G. Ellenton, P.K. Misra, B. Ley

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1982-1984

APPROXIMATE COST PER YEAR: \$30,000

PROJECT OBJECTIVES/DESCRIPTION

The MOE Lagrangian Model was used to calculate monthly and annual wet sulphur deposition for the period 1978-1980. Trajectories initiated every 3 hrs for the study period were combined with a precipitation field gridded at 3 hr. intervals and with seasonally varying model parameters (i.e. mixed layer height, conversion rate, deposition rates).

The model calculated monthly deposition was compared with the observed deposition at sites in northeastern North America where data are available for at least part of the period 1978-1980. The model calculations explain approximately 50% of the variance in the monthly trends. Emissions were varied only annually (except for the shutdown of Sudbury sources); hence, the majority of the observed variation in wet deposition may be explained in terms of the changing meteorology.

Next, the influence of the Sudbury sources was assessed by re-introducing their emissions for the shut-down period.

LRTAP PROJECT DESCRIPTION

TITLE

Development Lagrangian Model for Seasonal and Annual Deposition of Sulphate in Eastern North America

PRINCIPAL INVESTIGATOR

NAME: G. Ellenton, P.K. Misra, B. Ley

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1980-1982

APPROXIMATE COST PER YEAR: \$50,000

PROJECT OBJECTIVES/DESCRIPTION

This model computes forward trajectories for SO₂ source locations in central and eastern North America. The model parameterizations are:

- 1) linear chemistry given by a constant SO₂ to SO₄ conversion rate
- 2) dry deposition via constant deposition velocities
- 3) wet deposition using constant scavenging coefficients

The objectives of this project were:

- a) to determine the geographical and seasonal patterns of dry and wet deposition of sulphate in eastern North America
- b) to derive sulphate source-receptor relationships subject to model limitations (i.e. linear chemistry and simplified deposition parameterizations)
- c) to develop a climatology of sulfate deposition by running the model over a number of years of data

The model was evaluated using a limited data set for 1979. (See Ellenton et al., Atmos. Environ., 19, pp. 727-737 for details.)

LRTAP PROJECT DESCRIPTIONTITLE

Lagrangian Model With Complex Chemistry

PRINCIPAL INVESTIGATOR

NAME: Contractor - Concord Scientific (1984-85) PHONE: (416) 965-5068
Project Officer - B. Ley

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1984-1986

APPROXIMATE COST PER YEAR: \$85,000 (1984-1985)
\$40,000 (1985-1986)

PROJECT OBJECTIVES/DESCRIPTION

A gas and aqueous phase complex chemistry component has been added to the MOE Lagrangian Model. The model will then run as a two box model (subcloud and cloud layers) transported along computed trajectories.

The objectives of the project are:

- 1) to investigate the effects of non-linear chemistry on sulfate deposition in eastern North America
- 2) to model oxidant concentrations and photochemistry.

The gas and aqueous phase complex chemistry model has been developed. Initial evaluation of the model will be performed by ARB staff using OSCAR data.

LRTAP PROJECT DESCRIPTION

TITLE

Application of the Lagrangian Model for Special Studies

PRINCIPAL INVESTIGATOR

NAME: B. Ley

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1984-1985

APPROXIMATE COST PER YEAR: \$15,000

PROJECT OBJECTIVES/DESCRIPTION

The MOE Lagrangian model of the long range transport and deposition of sulphur oxides has been employed for several special studies including:

- a) intercomparison with the observations of the CAPTEX Study
- b) development of annual source-receptor transfer coefficients for 1978, 1979 and 1980
- c) participation in the International Sulfur Deposition Model Evaluation (ISDME) which is currently being undertaken for the model year 1980.

PROJECT NUMBER

88

SUBJECT CODE

1.5

LRTAP PROJECT DESCRIPTION

TITLE

Evaluation of the Lagrangian Model for 1982

PRINCIPAL INVESTIGATOR

NAME: B. Ley

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1984-1985

APPROXIMATE COST PER YEAR: \$30,000

PROJECT OBJECTIVES/DESCRIPTION

The MOE Lagrangian model has been used to calculate monthly wet sulphate deposition and average sulphate air concentration over eastern North America during 1982.

Due to improved sampling and analysis procedures there exists for 1982 a much larger and better quality set of observations of wet deposition of SO₄ that has previously been available. A detailed assessment of the model is currently underway.

LRTAP PROJECT DESCRIPTION

TITLE

Mesoscale Winds Model for Application to Medium Scale (10-300 km) Transport and Deposition

PRINCIPAL INVESTIGATOR

NAME: Contractor - S. Maddukuri
B. Ley

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1984-1985

APPROXIMATE COST PER YEAR: \$70,000

PROJECT OBJECTIVES/DESCRIPTION

The objective of this project was to develop a 3-dimensional wind field model for determining winds over a grid scale of 5-20 km. The model uses routine synoptic scale (300 km separation) meteorological data to initialize the model integration. Topography, surface roughness and surface heating force mesoscale variations. The initial version of the model was delivered by the contractor in January 1984.

The model was corrected, updated, and implemented by ARB staff for the Toronto region (area 240 km x 240 km). Winds are calculated at 10 vertical levels between the surface and 700 mb. The boundary layer height is prescribed by a 1-D diagnostic model.

Air Resources Branch staff have developed a multilayer trajectory model to employ with the model output winds.

PROJECT NUMBER
90

SUBJECT CODE
1.5

LRTAP PROJECT DESCRIPTION

TITLE

Application of A Mesoscale, Sulphur Oxides Transport and Deposition to the Sudbury Region

PRINCIPAL INVESTIGATOR

NAME: Contractor - to be determined
Project Officer - B. Ley

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985-1986

APPROXIMATE COST PER YEAR: \$50,000

PROJECT OBJECTIVES/DESCRIPTION

The objective of this project is to apply a medium scale trajectory model to the calculation of wet and dry depositio from the SO₂ sources in the Sudbury region. The model will be used to estimate the changes in deposition and air concentrations which may occur when emissions change for an extended period of time (e.g. several months). Also, the model results will be compared with the calculations of the Lagrangian long range transport model.

It is proposed that the model employ a mesoscale winds model to drive a multilayer trajectory model including linear sulphur chemistry.

LRTAP PROJECT DESCRIPTION

TITLE

Acid Deposition and Oxidant Model(ADOM)

PRINCIPAL INVESTIGATOR Environmental Research and Technology Inc. and MEP Co.

NAME: Project Co-ordinator: P.K. Misra PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES Environment Canada
AND INVESTIGATORS Federal Republic of Germany
(IF APPLICABLE):

DURATION: 1982-1986

APPROXIMATE COST PER YEAR: \$1 million

PROJECT OBJECTIVES/DESCRIPTION

It is a state of the science Eulerian model including complex chemistry, three dimensional transport and dispersion, cloud physics, aqueous chemistry and wet scavenging and detailed surface treatment for dry deposition.

The purpose of the model development is to investigate:

- a) how non-linear is the relationship between emissions of acidifying pollutants and their deposition on sensitive receptors
- b) what impacts this relationship has on reduction of acidic deposition at sensitive receptors subject to a reduction of emissions.

The first phase of the model development has been completed and is undergoing evaluation with OSCAR and PEPE/NEROS data.

LRTAP PROJECT DESCRIPTION

TITLE

Analysis of APIOS Data to Develop and Test Means for Evaluating Eulerian Long Range Transport Models

PRINCIPAL INVESTIGATOR

NAME: R. Bloxam

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985-1986

APPROXIMATE COST PER YEAR: \$50,000

PROJECT OBJECTIVES/DESCRIPTION

The output of long range transport models must be evaluated with data. This comparison is necessary to test the quality of the results produced by the model and to ensure that the model is adequately simulating the physics, chemistry and meteorological processes going on in atmosphere. Once you have have assurance that the model is giving the right answer for the right reasons then the model can be used to test emission reduction scenarios.

The objective of this project is to develop and test the techniques which might be used in evaluating the Eulerian model (using surface chemistry monitoring networks). This analysis should indicated the time and space scales needed to allow a significant evaluation with any particular technique.

SUBJECT CODE
1.5

PROJECT NUMBER
93

LRTAP PROJECT DESCRIPTION

TITLE

Meteorology and Climatology of Precipitation Episodes

PRINCIPAL INVESTIGATOR (Project has been let for contract)

NAME: Project Officer - R. Bloxam

PHONE: (416) 965-5068

AGENCY AND DEPARTMENT: Atmospheric Model Development Unit
Air Resources Branch
Ontario Ministry of the Environment

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985-1986

APPROXIMATE COST PER YEAR: \$50,000

PROJECT OBJECTIVES/DESCRIPTION

OME is developing an Eulerian long range transport model. Because of the complexity of this model (nonlinear chemistry and physics modules) it is computer intensive and it would be expensive to run the model on an hourly basis for an entire year.

This project will investigate the possibility of using a climatology of precipitation episodes for a year combined with a limited set of episodic data to yield annual or seasonal deposition. Observed daily data for the APIOS network will be used to define the episodes.

In addition to answering the question of whether or not annual deposition can be derived from a limited set of episode studies, this project will produce a climatology of precipitation events for regions in Ontario for 1 or 2 years.

DESCRIPTION DU PROJET DE TADPATITRE

Calibration et optimisation du modèle québécois de transport à grandes distances des polluants atmosphériques

NOM DU CHERCHEUR RESPONSABLE: Jean-Pierre Fortin PHONE: (418) 657-2560

MINISTRE, ORGANISME OU SERVICE: Institut national de la recherche scientifique (INRS - Eau)

ADRESSE: 2700, rue Einstein
Sainte-Foy, Québec
G1V 4C7

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Direction de la météorologie, (MENVIQ)
Direction de l'assainissement de l'air, (MENVIQ)

DURÉE DE CHAQUE PHASE: Phase 1, 2, et 3: 1985; Phase 4 et 5: 1985-86

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Apporter les modifications au modèle de transport des composés du soufre déjà existant dans le but de caler celui-ci sur les observations du réseau de collecte de précipitations.

Intégrer au modèle les caractéristiques régionales de la précipitations.

Phase 1 - Ajuster les paramètres de lessivage, des taux de dépôt de transformation.

Phase 2 - Intégrer les variations saisonnières de la hauteur de la couche limite.

Phase 3 - Intégrer la hauteur des sources d'émission des composés du soufre.

Phase 4 - Modifier le modèle pour tenir compte des caractéristiques régionales de la précipitation tout au long des trajectoires.

Phase 5 - Calibrer les dépôts saisonniers calculés de soufre sur les dépôts mesurés.

DESCRIPTION DU PROJET DE TADPA

TITRE

Amélioration du modèle québécois du transport à grandes distances des polluants atmosphériques

NOM DU CHERCHEUR RESPONSABLE: Claude Lelièvre

PHONE: (418) 643-5559

MINISTRE, ORGANISME OU SERVICE: Direction de l'assainissement de l'air,
(MENVIQ)

ADRESSE: 2360, chemin Sainte-Foy
Sainte-Foy, Québec
G1X 4E4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S):

DURÉE DE CHAQUE PHASE: Phase 1 et 2: 1985, Phase 3: 1986, Phase 4: 1987

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Améliorer la fiabilité du modèle.

Quantifier la précision des résultats produits par le modèle.

Phase 1 - Ajuster les paramètres du modèle afin d'améliorer les dépôts calculés par le modèle.

Phase 2 - Effectuer une comparaison entre les dépôts observés des polluants à ceux prévus par le modèle.

Phase 3 - Quantifier les conséquences des hypothèses qui sont à la base du modèle.

Phase 4 - Incorporer d'autres polluants que les oxydes de soufre: oxydes d'azote, oxydants et hydrocarbures.

PROJECT NUMBER

96

SUBJECT CODE

1.5

LRTAP PROJECT DESCRIPTION

TITLE

Lagrangian Model Evaluation and Application

PRINCIPAL INVESTIGATOR

NAME: M.P. Olson and E.C. Voldner

PHONE: (416) 667-4903

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 4T5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

J.W. Bottnheim,
K.K. Oikawa, AES;
WSD - Regions, AES;

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$25,000 - \$55,000

PROJECT OBJECTIVES/DESCRIPTION

Lagrangian LRTAP models are evaluated, improved and applied to the federal LRTAP program objectives and used in support of related programs such as the Arctic studies. Data bases are maintained, updated and made available to various users.

The trajectory model provides direct concentration model input data as well as supports diverse data analyses activities. This model, the sulphur concentration model and the advanced sulphur-nitrogen model are evaluated using observed data to improve simulation and reduce uncertainty. Established modelling technology is transferred to AES regional field offices where used operationally.

SUBJECT CODE
1.5

PROJECT NUMBER
97

LRTAP PROJECT DESCRIPTION

TITLE

Eulerian Model Development and Field Evaluation Project

PRINCIPAL INVESTIGATOR

NAME: A. Christie

PHONE:

AGENCY AND DEPARTMENT: AES, Downsview

ADDRESS: 4905 Dufferin Street
Downsview, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Ontario Ministry of the Environment, MEP Consultants,
Toronto, ERT., Concord, Mass., Federal Republic of
Germany, U.S. Agencies (field study)

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$150,000

PROJECT OBJECTIVES/DESCRIPTION

Cooperative work on a 12-level model with highest resolution in the boundary layer is underway. It is designed in modular fashion to integrate sequentially the in-loud processes of chemistry and mass transfer, vertical cloud and droplet inter-layer transfer and wet deposition within a central operator followed by advection/diffusion and dry deposition. The data management system uses meteorological information derived from the CMC version-9 spectral model augmented by a high resolution finite element PBL model below 850 mb. This system, developed by MEP. Co., has been utilized to generate meteorological input fields for the transport/transformation/deposition component for periods of OSCAR of April Rains. The ERT developed model is currently operational at Minissota and will be installed at CMC by 1986. Sensitivity studies run with the OSCAR and PEPE-NEROS episodes will provide guidance on future development.

PROJECT NUMBER
98

SUBJECT CODE
1.5

LRTAP PROJECT DESCRIPTION

TITLE

Long-range Transport Modelling Using Fisher's Model

PRINCIPAL INVESTIGATOR

NAME: S. Wright

PHONE: (416) 231-4111

AGENCY AND DEPARTMENT: Ontario Hydro Research Division

ADDRESS: 800 Kipling Avenue
Toronto, Ontario
M8Z 5S4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Ontario Hydro Technical & Training Services Division

DURATION: 1985

APPROXIMATE COST PER YEAR: \$15,000

PROJECT OBJECTIVES/DESCRIPTION

Improve and apply Fisher's statistical long-range transport model in 1985:

- improve wind and precipitation data used in grid over northeastern North America
- update model to include two scavenging coefficients in the treatment of NO_x
- improve the computer code
- run the model and compare results to observed data
- run the model using emission scenarios provided by Technical & Training Services Division

SUBJECT CODE
1.5

PROJECT NUMBER
99

LRTAP PROJECT DESCRIPTION

TITLE

Puff Statistics from Ensembles of Individual Trajectories

PRINCIPAL INVESTIGATOR

NAME: E. Alp

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT:

ADDRESS: Concord Scientific Corporation
2 Tippet Road
Downsview, Ontario
M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Sponsor: Ontario Ministry of the Environment

DURATION: 8 months

APPROXIMATE COST PER YEAR: \$ 60,000 (8 months)

PROJECT OBJECTIVES/DESCRIPTION

Statistical parameters needed for a statistical model were calculated using 3- and 6- hourly trajectories of 96-h duration for every month for the years 1978-1980. Seasonal and annual statistics have also been calculated. These parameters have then been used in the statistic model leading to improved predictions of acidic deposition.

PROJECT NUMBER
100

SUBJECT CODE
1.5

LRTAP PROJECT DESCRIPTION

TITLE

Development of CEA Long Range Transport and Acidic Deposition Modelling Systems

PRINCIPAL INVESTIGATOR

NAME: R.V. Portelli

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT:

ADDRESS: Concord Scientific Corporation
2 Tippet Road
Downsview, Ontario
M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)

Sponsor: Canadian Electrical Association
Other Investigators: E. Alp, C.S. Fung and N.W. Reid

DURATION: 4 years +

APPROXIMATE COST PER YEAR: \$140,000

PROJECT OBJECTIVES/DESCRIPTION

Development of modular modelling systems for long range transport and acidic deposition, based upon state-of-the-art statistical and Lagrangian models, input data (emissions, meteorology, etc.) and model evaluation data (wet and dry deposition).

The development of the statistical modelling system SERTAD (for Statistical Estimates of Regional Transport and Acidic Deposition) has essentially been completed and the model has been shown to perform well against observed data.

SUBJECT CODE
1.5

PROJECT NUMBER
101

LRTAP PROJECT DESCRIPTION

TITLE

Deposition Transport Models for Natural Gas Compressor Stations

PRINCIPAL INVESTIGATOR

NAME: N.W. Reid

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT:

ADDRESS: Concord Scientific Corporation
2 Tippet Road
Downsview, Ontario
Canada, M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Sponsor: American Gas As

DURATION: 6 months

APPROXIMATE COST PER YEAR: \$50,000

PROJECT OBJECTIVES/DESCRIPTION

To review and assess currently available LRT models and select the model(s) most suitable for implementating to evaluate the contribution of natural gas compressor stations to LRT and acidic deposition.

PROJECT NUMBER

102

SUBJECT CODE

1.5

LRTAP PROJECT DESCRIPTION

TITLE

Implementation of Complex Gas and Aqueous Phase Chemical Mechanisms in Lagrangian Long-range Transport Model

PRINCIPAL INVESTIGATOR

NAME: N.W. Reid

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT:

ADDRESS: Concord Scientific Corporation
2 Tippet Road
Downsview, Ontario
M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)

Sponsor: Ontario Ministry of the Environment
Other Investigators: C.S. Fung, L.H. Lam

DURATION: 1 year

APPROXIMATE COST PER YEAR: \$ 85,000

PROJECT OBJECTIVES/DESCRIPTION

State of the art gas and aqueous phase chemical mechanisms were implemented in an existing Lagrangian model to allow evaluation of the linear chemistry assumption commonly employed in such models, and to provide a model more economical to use than the current generation of Eulerian LRT models.

SUBJECT CODE
1.5

PROJECT NUMBER
103

LRTAP PROJECT DESCRIPTION

TITLE

Acidic Snowmelt Shock Potential

PRINCIPAL INVESTIGATOR

NAME: P.Y.T. Louie/B.E. Goodison

PHONE: (416) 667-4521

AGENCY AND DEPARTMENT: Hydrometeorology Division
Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Ontario Ministry of the Environment,
Dorset, Ontario

DURATION: 3 years, 84/85 - 86/87

APPROXIMATE COST PER YEAR: \$13,000 (85/86), \$9,000 (86/87)

PROJECT OBJECTIVES/DESCRIPTION

1986/87 is the wrap-up year for this project undertaken to improve the knowledge of the characteristics of snowmelt processes and snowpack and melt water chemistry associated with acidic snowmelt shock potential episodes.

An analysis of 1985/86 winter field data is carried out. The snowmelt model is modified to compute various pollutant concentrations. The H^+ concentration is presently computed. Using climate data to derive statistics on acid shock events (eg. frequency, intensity, etc.), the model is run for selected regions. A summary of the field data is compiled. The main output is a final version of the snowmelt acidic shock model.

PROJECT NUMBER
104

SUBJECT CODE
1.5

LRTAP PROJECT DESCRIPTION

TITLE

Snowmelt - Fish Kill

PRINCIPAL INVESTIGATOR

NAME: D.M. Whelpdale

PHONE: (416) 667-4903

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES Prof. H.H. Harvey, U of Toronto
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 4 years, 1983/84 - 1986/87

APPROXIMATE COST PER YEAR: \$3,000 - \$5,000

PROJECT OBJECTIVES/DESCRIPTION

A snowmelt model for use in the investigation of spring shock fish kills is evaluated using data collected at field sites in Dorset, Ontario during the winters of 83/84 and 84/85.

Snowmelt episodes in the collected data are used to evaluate the P.Y.T. Louie model. On evaluation, the model is applied to historical cases of fish kills.

LRTAP PROJECT DESCRIPTIONTITLE

SO₂/NO_x Emission Characterization and Measurement Technology Development

PRINCIPAL INVESTIGATOR

NAME: R.B. McCaig, Head

PHONE: (613)998-4772

AGENCY AND DEPARTMENT: Source Measurement Section
Environmental Protection Service
Environment Canada
Pollution Measurement Division

ADDRESS: River Road Environmental Technology Centre
River Road
Ottawa, Ontario
K1A 1C8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: 0.8 PY, \$ 25,000

PROJECT OBJECTIVES/DESCRIPTION

SO₂/NO_x from selected point sources, including those using fluidized bed (FBC) and limestone injection (LIMB) technology, will be characterized and related to process parameters. Continuous sampling techniques for SO₂, NO/NO₂, HCL and SO₃ are being refined, documented and applied to numerous stationary sources. Manual techniques for heavy metals, particulates, SO₂, SO₃, NO_x, organics and HCL have been developed and applied to numerous stationary sources.

PROJECT NUMBER
106

SUBJECT CODE
1.6

LRTAP PROJECT DESCRIPTION

TITLE

Acid Precipitation Monitor

PRINCIPAL INVESTIGATOR

NAME: Professor R.A. Stairs

PHONE: (705) 748-1506

AGENCY AND DEPARTMENT: Trent University
Department of Chemistry

ADDRESS: Peterborough, Ontario
K9J 7B8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 3 years

APPROXIMATE COST PER YEAR: \$ 5,000

PROJECT OBJECTIVES/DESCRIPTION

To develop a low-cost device suitable for adding to remote automatic weather stations to monitor precipitation for acidity.

Prototype device now in use measures conductances of rain before and after treatment with ion exchange resin. Computes and stores acidity/alkalinity and salinity.

SUBJECT CODE
1.6

PROJECT NUMBER
107

LRTAP PROJECT DESCRIPTION

TITLE

Development of Sampling and Analytical Techniques for Peroxyacetyl Nitrate, Hydrocarbons and Carbon Dioxide in the Atmosphere.

PRINCIPAL INVESTIGATOR

NAME: P. Fellin

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT:

ADDRESS: CONCORD SCIENTIFIC CORPORATION
2 Tippet Road
Downsview, Ontario
M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Atmospheric Environment Services - Downsview

DURATION: 2 years

APPROXIMATE COST PER YEAR: \$ 90,000/2 years

PROJECT OBJECTIVES/DESCRIPTION

A three part program was initiated by AES to develop instrumental analysis techniques CO₂, hydrocarbons and peroxy acetyl nitrate (PAN). Each of the techniques makes use of gas chromatographic instrumentation to detect the compounds of interest in a selective and very sensitive manner. The CO₂ component of the program utilizes an electron capture detection system and is currently being evaluated as a technique for supplementing non dispersive infra-red measurements. Hydrocarbon measurements utilize cryogenic trapping with separation of compounds on a capillary column with detection by flame ionization detector. While PAN being monitored by gc chromatograph with an electron capture detector. The program is currently in the second phase. PAN Monitoring techniques have been used in the field for semi-routine measurements. Hydrocarbon and CO₂ monitoring techniques still require further development.

PROJECT NUMBER
108

SUBJECT CODE
1.6

LRTAP PROJECT DESCRIPTION

TITLE

Development of a Diffusion Denuder Based Instrument for Sampling of Atmospheric Ammonia

PRINCIPAL INVESTIGATOR

NAME: P. Fellin

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT:

ADDRESS: CONCORD SCIENTIFIC CORPORATION
2 Tippet Road
Downsview, Ontario
M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Atmospheric Environment Services - Downsview

DURATION: 7 months

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

An instrument was constructed for sampling and analysis of ammonia in air at the part per billion level. The instrument was based on collection of ammonia on tungstic oxide coated diffusion denuders at ambient temperatures and desorption in a separate cycle at elevated temperatures. Conversions of the ammonia by gold coated converter to nitric oxide permits detection using sensitive chemiluminescent analyzers. Automation of analyzer functioning permits operation with minimal operator attention.

LRTAP PROJECT DESCRIPTION

TITLE

Central Regional LRTAP Studies - Precipitation Sampler Development

PRINCIPAL INVESTIGATOR

NAME: D.G. Schaefer

PHONE: (204) 949-4379

AGENCY AND DEPARTMENT: Central Region, Atmospheric Environment Service

ADDRESS: 266 Graham Avenue
10th, Floor, Room 1000
Winnipeg, MB
R3C 3V4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

R. Hopkinson, Cental Region, AES:
Saskatchewan Research Council

DURATION: 1984/85 to 1986/87 (Final report December 1986)

APPROXIMATE COST PER YEAR: \$2,000 - \$3,000

PROJECT OBJECTIVES/DESCRIPTION

Precipitation Sampler Development:

Evaporation represents a large portion of the difference between sample and standard gauge catches which can alter the concentration of samples and cause high calculated deposition. Catch efficiencies of both CANSAP and CAPMoN samplers will be evaluated and evaporative losses, if any, quantified from a sampling site at the Regina, Saskatchewan airport between September 1984 and October 1986.

A cooperative program to upgrade regional CAPMON is planned.

PROJECT NUMBER
110

SUBJECT CODE
1.6

LRTAP PROJECT DESCRIPTION

TITLE

DIAL - Spectroscopy

PRINCIPAL INVESTIGATOR

NAME: R.A. Hoff

PHONE: (416) 667-4786

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Wardle, ARPX, Atmospheric Environment Service
Van Amerom

DURATION: 1987/88

APPROXIMATE COST PER YEAR: \$65,000 - \$100,000

PROJECT OBJECTIVES/DESCRIPTION

The vertical structure and burden of SO₂ and O₃ are required to evaluate transport of these gases. DIAL technology for these measurements is validated and compared to other techniques (eg. COSPEC, Brewer spectrometer technologies). Field testing of the facility during the Eulerian model evaluation experiments is planned.

Long-path spectroscopic techniques for other species (eg. HNO₂, NO₃) are examined and compared to DIAL active source measurements.

SUBJECT CODE

1.6

PROJECT NUMBER

111

LRTAP PROJECT DESCRIPTION

TITLE

Development of Ambient Air Monitoring Technology for VOCs

PRINCIPAL INVESTIGATOR

NAME: T. Dann, A/Chief

PHONE: (613)998-4705

AGENCY AND DEPARTMENT: Pollution Measurement Division
Environmental Protection Service
Environment Canada

ADDRESS: River Road Environmental Technology Centre
River Road
Ottawa, Ontario
K1A 1C8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: ongoing. Routine monitoring at 2 sites began in mid-1984

APPROXIMATE COST PER YEAR: 1.0 PY, \$ 70,000

PROJECT OBJECTIVES/DESCRIPTION

Methods applicable to the sampling and analysis of organic compounds (both toxic and/or oxidant precursors) in urban air are being developed, field tested and documented. Sampling at sites in Toronto and Montreal began in mid-1984. Twenty-four hour concentrations of approximately 130 compounds from the alkane, alkene, aromatic and alkyl halide categories are reported on a three or six day sampling schedule. Both solid sorbent and canister sampling techniques are being evaluated. Analytical techniques include GC-FID/ECD, GC-MS and GC-PID.

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SECTION 2

AQUATIC EFFECTS

DESCRIPTION DU PROJET DE TADPATITRE

Evaluation des effets de l'acidification sur les lacs du bouclier canadien: relations entre les caractéristiques morphométriques, physico-chimiques et biologiques de 54 lacs du Québec. Rapport préliminaire présenté à Pêches et Océans Canada, 195 p. (1985)

NOM DU CHERCHEUR RESPONSABLE:

Bernadette Pinel-Alloul

PHONE:

(514) 343-6190

(514) 343-6792

MINISTRE, ORGANISME OU SERVICE:

Centre de recherches écologiques de Montréal
Université de Montréal

ADRESSE:

5858 Côte des Neiges, bureau 400
C.P. 6128, Succursale "A"
Montréal, Québec
H3C 3J7

COLLABORATEUR(S),

ORGANISME(S) ET CHERCHEUR(S): Ginette Méthot

DURÉE DE CHAQUE PHASE:

Décembre 1984 à juin 1985

COÛT APPROXIMATIF (PAR ANNÉE): \$ 14,000

OBJECTIFS DU PROJET ET DESCRIPTION

Objectifs: Evaluer les effets de la modification de la qualité des habitats aquatiques sur les communautés biologiques

Le présent rapport fait état des résultats des analyses multidimensionnelles globales effectuées sur les composantes morphométriques, physico-chimiques et biologiques dans le but de déterminer la typologie des lacs selon les différents descripteurs et d'évaluer les relations générales entre les composantes abiotiques et biotiques. Les relations observées sont discutées à la fois par rapport aux effets des précipitations acides et par rapport aux caractéristiques morphométriques des lacs.

DESCRIPTION DU PROJET DE TADPA

TITRE

Effet des précipitations acides sur la physico-chimie des lacs des régions de Papineau Labelle, Mont-Tremblant et Outaouais-sud

NOM DU CHERCHEUR RESPONSABLE: Jacques Dupont

PHONE: (418) 644-3297

MINISTRE, ORGANISME OU SERVICE: Direction des relevés aquatiques
Ministère de l'Environnement du
Québec, (MENVIQ)

ADRESSE: 3900, rue Marly
Sainte-Foy, Québec
G1X 4E4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Direction des laboratoires, (MENVIQ)

DURÉE DE CHAQUE PHASE: Phase 1, 2: au cours de 1984, Phase 3: début 1985 et
Phase 4: début 1986

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Déterminer l'ampleur de l'acidification des lacs dans une des zones les plus susceptibles d'être affectées au Québec.

Phase 1 - Choix de 81 petits lacs de tête.

Phase 2 - Échantillonnage par hélicoptère. Prise d'un échantillon intégré (0-5 m), sous couvert de glace, au centre géométrique de chaque lac.

Phase 3 - Analyse des ions majeurs, des paramètres physico-chimiques reliés à l'acidification, et de l'aluminium.

Phase 4 - Traitement et interprétation des résultats et publication d'un rapport.

DESCRIPTION DU PROJET DE TADPA

TITRE

Etude sur le Québec méridional des relations entre les taux de dépôts acides, la nature des milieux récepteurs et la composition physico-chimique des lacs

NOM DU CHERCHEUR RESPONSABLE: Yves Grimard et
Jacques Dupont

PHONE: (418) 644-3297

MINISTRE, ORGANISME OU SERVICE: Direction des relevés aquatiques
Ministère de l'Environnement du
Québec, (MENVIQ)

ADRESSE: 3900, rue Marly
Sainte-Foy, Québec
G1X 4E4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S):

DURÉE DE CHAQUE PHASE: Phase 1, 2, 3, et 4: 1985, Phase 5: 1985-86,
Phase 6: 1986

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Etude des relations inter-systèmes, à savoir relier les dépôts atmosphériques acides aux conditions physico-chimiques des plans d'eau du Québec méridional.

Phase 1 - Revue de littérature sur les modèles de relations intersystèmes existants.

Phase 2 - Recherche et sélection des données disponibles et pertinentes sur les dépôts acides, les caractéristiques du territoire étudié et la physico-chimie des plans d'eau.

Phase 3 - Création d'un fichier de données de bases validées.

Phase 4 - Synthèse descriptive des données.

Phase 5 - Recherches des zones du Québec méridional ayant une sensibilité comparable.

Phase 6 - Etude et recherche des relations empiriques entre la charge acide, la sensibilité du milieu et la physico-chimie des plans d'eau.

DESCRIPTION DU PROJET DE TADPA**TITRE**

Comparaison des caractéristiques physico-chimiques des eaux lacustres de qualité du massif Laurentien et de quatre lacs des monts Adirondack

NOM DU CHERCHEUR RESPONSABLE: Jacques Dupont

PHONE: (418) 644-3297

MINISTRE, ORGANISME OU SERVICE: Direction des relevés aquatiques
(MENVIQ)

ADRESSE: 3900, rue Marly
Sainte-Foy, Québec
G1X 4E4

**COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S):** Howard Simonin (New York State Department of
Environment Conservation)

DURÉE DE CHAQUE PHASE: Phase 1: 1984, Phase 2, 3, et 4: 1985

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Comparer les caractéristiques physico-chimiques de certains lacs du massif Laurentien et des monts Adirondack.

Effectuer des comparaisons inter-laboratoires entre les méthodes d'analyses.

Développer une expertise dans le domaine de l'évaluation du niveau d'acidité des lacs.

Phase 1 - Échantillonnage régulier de quatre lacs du massif Laurentien et de quatre lacs des monts Adirondack.

Phase 2 - Effectuer une étude comparative de la physico-chimie des huit lacs.

Phase 3 - Estimer le niveau d'acidification des lacs du massif Laurentien et des monts Adirondack.

Phase 4 - Effectuer une inter-comparaison des données et des méthodes d'analyse en laboratoire.

DESCRIPTION DU PROJET DE TADPA

TITRE

Inventaire physico-chimique de 115 lacs de la région du Pontiac-Témiscamigue

NOM DU CHERCHEUR RESPONSABLE: Jacques Dupont et
Yves Grimard

PHONE: (418) 643-2172

MINISTRE, ORGANISME OU SERVICE: Direction des relevés aquatiques
Ministère de l'Environnement du Québec,
(MENVIQ)

ADRESSE: 3900, rue Marly
Sainte-Foy, Québec
G1X 4E4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Direction des laboratoires, (MENVIQ)

DURÉE DE CHAQUE PHASE: Phase 1, 2, et 3: 1985; Phase 4: 1986

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Réaliser un inventaire physico-chimique portant sur 115 lacs de la région du Pontiac-Témiscamigue afin d'obtenir un portrait plus précis de l'acidité des lacs de cette région.

Constituer une banque d'informations sur ces 115 lacs permettant la sélection de 50 d'entre eux pour des fins d'études ichtyologiques portant principalement sur le touladi et le doré jaune.

Phase 1 - Elaboration des critères de sélection à partir de l'information déjà existante, et sélection des lacs.

Phase 2 - Echantillonnage physico-chimique des lacs.

Phase 3 - Analyse préliminaire des données et sélection de 50 lacs pour l'étude.

Phase 4 - Traitement et interprétation des données à l'égard de la variation spatiale de l'acidité des lacs.

LRTAP PROJECT DESCRIPTIONTITLE

Spring pH Fluctuations in the North Branch Oromocto River, New Brunswick

PRINCIPAL INVESTIGATOR

NAME: W.C. Ayer

PHONE: (506) 453-2669

AGENCY AND DEPARTMENT: Environmental Services Branch
Environment New Brunswick

ADDRESS: P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1982-1985

APPROXIMATE COST PER YEAR: \$ 2,000

PROJECT OBJECTIVES/DESCRIPTION

To assess temporal fluctuations in pH and other water quality parameters with respect to spring freshet in the North Branch Oromocto River.

Bi-weekly collections during winter months including water quality and snow.

Analysis for pH, alkalinity, turbidity, Cl^- , NO_x , SO_4^{2-} , Ca^{++} , Mg^{++} , Na^+ , K^+ , TOC, NH_3T , Al-x .

LRTAP PROJECT DESCRIPTION

TITLE

Trace Metal Dynamics in Acid Sensitive Lakes of Nova Scotia

PRINCIPAL INVESTIGATOR

NAME: H.K. Wong
J.O.Nriagu

PHONE: (416) 637-4382

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: April, 1984 - March 86

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

A major contribution of pollutant metal and acid input in the remote (rural) lakes of Nova Scotia comes from atmospheric deposition. The mechanism of trace metal transfer (flux) within the water column is a vital link in the study of metal cycles in relation to lake acidification. Consequently, seasonal trap material within the water column are being monitored as a means of understanding the evolution and flux of the particulate metal pool.

The program aims to estimate the flux of heavy metals (Pb, Zn, Cu, Ni, Cd) including sulfur and aluminum, into lake water and sediment; to assess the role of suspended particulate mater in the chemistry of pollutant metals in softwater lakes; to assess the changes in the rate of atmospheric loading of trace metals and other pollutants by relating the historical record of source emissions to records in recent sediments; to evaluate specially Al, in the sediments of these softwater lakes.

LRTAP PROJECT DESCRIPTION

TITLE

Episodic Acidification of Insular Newfoundland Rivers

PRINCIPAL INVESTIGATOR

NAME: D.A. Scruton

PHONE: (709) 702-4485

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: P.O. Box 5667
St. John's, Newfoundland
A1C 5X1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Environmental Chemistry Laboratory
Victoria Public Hospital, Halifax, Nova Scotia

DURATION: November 1985 to November 1987

APPROXIMATE COST PER YEAR: \$25,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the magnitude, duration, and timing of pH depressions in acid-sensitive rivers in insular Newfoundland.

Nine rivers are to be sampled weekly, or more frequently during hydrological episodes, for a period of two years. Data will be evaluated to determine the influence of season and hydrology on temporal variability in key water quality parameters. The threat of episodic acidification to resident biota will be investigated.

LRTAP PROJECT DESCRIPTION

TITLE

Acid Precipitation and Ground Water Recharge Chemistry

PRINCIPAL INVESTIGATOR

NAME: K. Inch

PHONE: (613) 995-4007

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: Place Vincent Massey
351 St. Joseph Blvd
Ottawa, Ontario
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985 - 1987

APPROXIMATE COST PER YEAR: \$ 6,500

PROJECT OBJECTIVES/DESCRIPTION

Ground water acidification by strong acid deposition has been frequently observed in Scandinavia but has not been documented in Canada. It is important to know whether ground water is vulnerable to acid shock events during major recharge periods as well as in the long term.

Program aims to identify the effects of acid precipitation on the chemistry of ground water recharge during major recharge periods (spring snowmelt, summer and fall storms) in an area of low acid neutralization capacity and high acid deposition (CRNL); and to compare these effects to those observable in an area of moderate acid neutralization capacity and moderate acid deposition (Turkey Lakes Watershed).

LRTAP PROJECT DESCRIPTION

TITLE

Aluminum Contamination of Ground Water by LRTAP

PRINCIPAL INVESTIGATOR

NAME: H. Chew

PHONE: (613) 995-4058

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: Place Vincent Massey
351 St. Joseph Blvd
Ottawa, Ontario
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985 - 1987

APPROXIMATE COST PER YEAR: \$ 12,000

PROJECT OBJECTIVES/DESCRIPTION

Aluminum is a potentially toxic element and its toxicity depends on its speciation. Little is known in Canada about the impact of acid precipitation on the chemistry of Al in ground water systems.

This program aims:

1. To develop a methodology for the sampling and analysis of aluminum in ground water and for identifying its speciation.
2. To apply this methodology to study the behaviour of aluminum in ground water at the Turkey Lakes Watershed and CRNL.

LRTAP PROJECT DESCRIPTION

TITLE

Origin of Organic Waters and Their Impact on Aquatic Ecosystems

PRINCIPAL INVESTIGATOR

NAME: R.A. Bourbonniere

PHONE: (416) 637-4547

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: April, 1984 - March 1988

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

Natural organic acidity has been recognized as a significant contributor to the total acidity of Nova Scotia rivers. As such, it affects our understanding to the degree to which airborne pollutants impact those waters.

Organic matter, by its interaction, influences the toxicity of metals such as aluminum. Thus, we have a tie to the potential impact on aquatic biota.

Program involves characterization of the chemical composition, both organic and inorganic, of lake and river waters from LRTAP sites in Nova Scotia to show how natural organic acidity contributes to the total acidity.

Specific components of interest are hydrophobic and hydrophilic organic acids, toxic metals such as aluminum, lead, and mercury and other components which interact with toxic constituents.

PROJECT NUMBER
123

SUBJECT CODE
2.2

LRTAP PROJECT DESCRIPTION

TITLE

Estimation of Sulfate Reduction Associated Alkalinity Production and the Rate of Lake Acidification as Inferred from Downcore Diatom Stratigraphies in Lakes North of Lake Superior, Canada

PRINCIPAL INVESTIGATOR

NAME: Dr. Mike Dickman

PHONE: (416) 688-5550
ext. 3392

AGENCY AND DEPARTMENT: Department of Biological Sciences

ADDRESS: Brock University
St. Catharines, Ontario
L2S 3A1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. Harry Thode
Chemistry Department
McMaster University
Hamilton, Ontario
L8S 4L8

Dr. Salem Rao
Canada Centre for Inland
Waters
Box 5050
Burlington, Ontario

DURATION: July, 1984 - July, 1986

APPROXIMATE COST PER YEAR: \$ 50,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the relationship between bacterially mediated sulfate reduction, sulfur isotope ratio and downcore diatom inferred pH.

LRTAP PROJECT DESCRIPTION

TITLE

Lake Sediment Studies

PRINCIPAL INVESTIGATOR

NAME: Dr. P.J. Dillon

PHONE: (705) 766-2412

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Water Resources Branch
Aquatic Ecosystems Section

ADDRESS: Dorset Research Centre
P.O. Box 39, Bellwood Acres Road
Dorset, Ontario POA 1E0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Evaluated yearly

APPROXIMATE COST PER YEAR: \$30,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the rates of accumulation of substances (metals, nutrients) in lake sediments. To reconstruct deposition rates in the lakes.

The chronologies of sediment cores from multiple sites in each of ten lakes have been established using ²¹⁰Pb methodology and the deposition patterns in the lakes investigated.

Whole lake accumulation rates of sediments, metals and nutrients will be obtained and related to mass balance measurements. Attempts to construct predictive sedimentation models will follow.

PROJECT NUMBER
125

SUBJECT CODE
2.2

LRTAP PROJECT DESCRIPTION

TITLE

Rates of Change of Lake pH determined from Algal "Fossils" in Lake Sediment

PRINCIPAL INVESTIGATOR

NAME: K.H. Nicholls

PHONE: (416) 248-3058

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment

ADDRESS: Aquatic Ecosystems Section
Ontario Ministry of the Environment
P.O. Box 213
Rexdale, Ontario
M9W 5L1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 5 years

APPROXIMATE COST PER YEAR: \$30,000

PROJECT OBJECTIVES/DESCRIPTION

To determine an inferred rate of change of pH in selected lakes in Muskoka-Haliburton.

Establish diatom and mellomonadacean taxonomy data base from surface sediments of 50 reference lakes with pH 4.5 - 7.5. Relate by multivariate methods associations of species to ranges of lake water pH. Employ these data in analysis of dated sediment cores (^{210}Pb methodology) selected lakes to determine rate of change of species associations = pH.

SUBJECT CODE

2.2

PROJECT NUMBER

126

LRTAP PROJECT DESCRIPTION

TITLE

Calibration of Sedimentary Diatom Analyses for Evaluating the Effects of Acid Precipitation

PRINCIPAL INVESTIGATOR

NAME: H.C. Duthie and S.M. Smith

PHONE: (519) 885-1211
Ext. 3224

AGENCY AND DEPARTMENT: Department of Biology

ADDRESS: University of Waterloo
Waterloo, Ontario
N2L 3G1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): NSERC Strategic Grant

DURATION: 3 years

APPROXIMATE COST PER YEAR: \$33,000

PROJECT OBJECTIVES/DESCRIPTION

We are investigating the relationship between pH and the diatom on three scales of approach. First, on the ecosystem scale, we are examining the relationship between the extant diatom flora and lake pH from a wide variety of lakes in acid-sensitive regions. Using multivariate statistics we hope to refine the methodology for estimating pH from the diatom flora. Second, on the community scale, we are examining the composition and ecology of diatom communities in acidic habitats. Thirdly, we are focussing attention on the autecology of those diatoms known to be acid indicators.

PROJECT NUMBER

127

SUBJECT CODE

2.2

LRTAP PROJECT DESCRIPTION**TITLE**

A Comparison of Diatom Inferred Rates of Lake Acidification between the Algoma Region, Canada, the Netherlands and Jutland Region, Denmark

PRINCIPAL INVESTIGATOR

NAME: Dr. Mike Dickman

PHONE: (416) 688-5550
ext. 3392

AGENCY AND DEPARTMENT:

ADDRESS: Brock University
St. Catharines, Ontario
L2S 3A1

**COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)**

Dr. Herman vanDam
Rijksinstituut voor Natuurbeheer
Leersum, Netherlands

Dr. Aage Rebsdorf
National Environmental
Agency
Silkeborg, Jutland
Denmark

DURATION: January, 1985 - January, 1988

APPROXIMATE COST PER YEAR:

Because of the three countries involved, no annual estimates are available for the combined program

PROJECT OBJECTIVES/DESCRIPTION

To determine whether the rate of lake acidification varies significantly between the three locations and to determine when acidification was first initiated in each of the nine study lakes.

DESCRIPTION DU PROJET DE TADPA

TITRE

Géochimie et géochronologie sédimentaire récente de huit lacs de la région de Rouyn-Noranda

NOM DU CHERCHEUR RESPONSABLE: Richard Carignan PHONE: (418) 657-2560

MINISTRE, ORGANISME OU SERVICE: Institut national de la recherche scientifique (INRS - Eau)

ADRESSE: 2700, rue Einstein
Sainte-Foy, Québec
G1V 4C7

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Direction de la recherche
Ministère de l'Environnement du Québec, (MENVIQ)
Direction des relevés aquatiques, (MENVIQ)

DURÉE DE CHAQUE PHASE: Phase 1: avril 85, Phase 2: novembre 85, Phase 3:
février 1986

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Etablir la chronologie de déposition de polluants d'origine anthropique (SO₄, Pb, Zn, Cu) dans huit lacs de la région de Rouyn-Noranda.

Etablir la chronologie de l'acidification (s'il y a lieu) des mêmes lacs telle qu'inférée à partir des chronologies de déposition d'éléments sensibles à l'acidification (Mn, Ca, Mg, Al).

Phase 1 - Prélèvement des carottes de sédiment dans les lacs.

Phase 2 - Analyses chimiques et géochronologiques.

Phase 3 - Compilation, interprétation des résultats et rédaction du rapport final.

PROJECT NUMBER
129

SUBJECT CODE
2.2

LRTAP PROJECT DESCRIPTION

TITLE

Paleolimnology Studies to Investigate Historical Evidence of Acidification in Insular Newfoundland Lakes

PRINCIPAL INVESTIGATOR

NAME: D.A. Scruton

PHONE: (709) 772-4485

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: P.O. Box 5667
St. John's, Newfoundland
P.O. Box 213
A1C 5X1

COOPERATIVE AGENCIES AND INVESTIGATORS (IF APPLICABLE): Dr. Janet Elner, Halifax, Nova Scotia

DURATION: August 1984 - March 1987

APPROXIMATE COST PER YEAR: \$25,000

PROJECT OBJECTIVES/DESCRIPTION

To use a paleolimnological approach (fossil diatoms) to examine sediments in freshwater lakes in insular Newfoundland for evidence of recent anthropogenic acidification.

Interface sediments were collected from 35 lakes in 1984. Identification/enumeration of fossil diatoms permitted calculation of index alpha and index B. Down core diatom stratagraphics and historical pH profiles were determined on five lakes. Samples collected in 1984 are being subjected to additional analyses to more precisely establish diatom/pH relation peculiar to insular Newfoundland. Additional cores will be collected in 1986-87 and sectioned at finer intervals (0.1-0.2 cm) to more accurately describe the time scale associated with pH changes.

LRTAP PROJECT DESCRIPTION

TITLE

Organic Matter Biodegradation in Lake Sediments - Effect of Acid Stress

PRINCIPAL INVESTIGATOR

NAME: S.S. Rao

PHONE: (416) 637-4312

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: April 1985 - December 1986

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

There are conflicting reports on the effects of acidification on the organic matter accumulation in lake sediments. The degradation of sedimentary organic matter contributes alkalinity and nutrients to overlying waters. The study of the effects of pH, SO₄ and NO₃ inputs on organic matter degradation therefore is fundamental to the understanding of the response of any lake to acid rain.

The goal of this project is to assess the effects of acidification on accumulation or biodegradation of organic matter in soft lake water sediments.

PROJECT NUMBER

131

SUBJECT CODE

2.2

LRTAP PROJECT DESCRIPTION

TITLE

Sensitivity of Surficial Sediments to Effect of Acid Precipitation

PRINCIPAL INVESTIGATOR

NAME: I. Kettles

PHONE: (613) 995-4523

AGENCY AND DEPARTMENT: Geological Survey of Canada

ADDRESS: 601 Booth Street
Ottawa, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: One year

APPROXIMATE COST PER YEAR: \$35,000

PROJECT OBJECTIVES/DESCRIPTION

Drift sampling in Georgian Bay and northwest of Ottawa to measure buffering capacity and trace metals in surficial sediments.

SUBJECT CODE
2.2

PROJECT NUMBER
132

LRTAP PROJECT DESCRIPTION

TITLE

Natural Gases in Lake Sediments: Implication for Trace Element Migration and Accumulation

PRINCIPAL INVESTIGATOR

NAME: W.W. Shilts

PHONE: (819) 995-4523

AGENCY AND DEPARTMENT: Geological Survey of Canada
Department of Energy, Mines and Resources

ADDRESS: 601 Booth Street
Ottawa, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

University of Waterloo (contract)

DURATION: One year

APPROXIMATE COST PER YEAR: \$ 28,000

PROJECT OBJECTIVES/DESCRIPTION

Investigation of the origin and importance of gases generated in lake sediments in moving cations to sediment surface. Little investigation conducted in Little Turkey Lake, Algoma region.

LRTAP PROJECT DESCRIPTION

TITLE

Use of Algal Indicators to Interpret Lake Acidification Histories

PRINCIPAL INVESTIGATOR

NAME: W.A. Glooschenko

PHONE: (416) 637-4229

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: April, 1985 - March 1986

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

To further understand the acidification history of lakes, use has been made of diatom distribution in sediment cores. This study will determine the value of such biotic indicators of lake acidification.

Goals:

1. To review literature on algal indicators of lake acidification and algae composition and ecology of acidic wetlands.
2. To determine the value of diatoms as paleoindicators of lake acidification.
3. To determine nature of export of algae from acidic wetlands into lakes and streams.

LRTAP PROJECT DESCRIPTION

TITLE

Impact of Stream Acidification on Invertebrates: Draft Response to in situ
Experiments Augmenting Aluminum Ion Concentrations

PRINCIPAL INVESTIGATOR

NAME: David P. Bernard

PHONE: (604) 228-4664

AGENCY AND DEPARTMENT: Institute of Animal Resource Ecology
University of British Columbia
2075 Wesbrook Mall
Vancouver, B.C.
V6T 1W5

COOPERATIVE AGENCIES Dr. William E. Neill, I.A.R.E.,
AND INVESTIGATORS University of British Columbia
(IF APPLICABLE)

DURATION: Spring 1982 - Fall 1985

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

Using field and laboratory experiments, we have systematically examined factors responsible for the "loss" of invertebrates from acidifying stream ecosystems. The response of acidification naive organism to elevated metal concentrations, particularly Al^{3+} , was tested through in situ experiments conducted in the Coast Range Mountain of British Columbia.

LRTAP PROJECT DESCRIPTION

TITLE

Consumption of H⁺ in Lake by Nitrate and Sulfate Reducing Bacteria

PRINCIPAL INVESTIGATOR

NAME: Carol Kelly

PHONE: (204) 786-9725

AGENCY AND DEPARTMENT: Biology Department

ADDRESS: University of Winnipeg
515 Portage Avenue
Winnipeg, Manitoba
R3B 2E9

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Department of Fisheries and Oceans
Freshwater Institute - John W.M. Rudd

DURATION: 3 years

APPROXIMATE COST PER YEAR: \$35,000

PROJECT OBJECTIVES/DESCRIPTION

- 1) To determine the magnitude of in situ H⁺ consumption by microorganisms in a variety of acidified and non-acidified lakes, including North America and Scandinavia.
- 2) To determine whether increasing acidification is inhibiting to these bacteria.

LRTAP PROJECT DESCRIPTIONTITLE

Mass Development of Filamentous Algae in Acid Lakes

PRINCIPAL INVESTIGATOR

NAME: M.B. Jackson

PHONE: (416) 248-3058

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment

ADDRESS: Aquatic Ecosystems Section
Ontario Ministry of the Environment
P.O. Box 213
Rexdale, Ontario
M9W 5L1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 5 years

APPROXIMATE COST PER YEAR: \$30,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the causes and consequences of massive development of filamentous algae in acidic lakes.

- 1) trend with time - long term monitoring with wholelake nearshore mapping of all major filamentous algal growth patterns (May-Sept.) + measurement of several environmental variables.
- 2) field and laboratory experiments to investigate causes, mechanisms and consequences of increased biomass of filamentous algae, including wholelake neutralization and acidification effects.

LRTAP PROJECT DESCRIPTIONTITLE

Benthos/Littoral Survey in Five Lakes of Various Sensitivities

PRINCIPAL INVESTIGATOR

NAME: L.W. Maki

PHONE: (807) 475-1215

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Northwestern Region

ADDRESS: 435 James Street South
Thunder Bay, Ontario
P7C 5G6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. K.J. Deacon Lake University, (Contractor)
Mr. J. Sutton Oliver Road
Dr. G.W. Ozburn Thunder Bay, Ontario
P7B 5E1
Telephone: (807) 345-2121

DURATION: Originally scheduled for open water season, 1982.
The survey was postponed and completed in 1983.

APPROXIMATE COST PER YEAR: \$27,000

PROJECT OBJECTIVES/DESCRIPTION

1. To determine if any symptoms of acid-stressed benthic and littoral communities exist in five headwater lakes of various sensitivities which receive moderate acidic deposition.
2. To establish baseline benthic and littoral communities in five lakes, against which future surveys can be compared.

Ponar dredges and D-nets were employed to sample the benthic and littoral zones respectively.

The report has been written, reviewed locally and returned to the author (K.J. Deacon). The report will be submitted for A.P.I.O.S. review by December 1985.

LRTAP PROJECT DESCRIPTION

TITLE

Phytoplankton and Zooplankton in Northwestern Ontario Lakes

PRINCIPAL INVESTIGATOR

NAME: L.W. Maki

PHONE: (807) 475-1215

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Northwestern Region

ADDRESS: 435 James Street South
Thunder Bay, Ontario
P7C 5G6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Mr. J. Sutton, Dr. K.J. Deacon, Dr. G.W. Ozburn
Lakehead University (Contractor)
Oliver Road
Thunder Bay, Ontario
P7B 5E1 (807) 345-2121

DURATION: Yearly

APPROXIMATE COST PER YEAR: \$38,000

PROJECT OBJECTIVES/DESCRIPTION

- To compile data on phytoplankton and zooplankton collected from selected Northwestern Ontario lakes from 1979-1981.
- To undertake a joint study of zooplankton/water chemistry relationships with Mr. W. Keller of M.O.E. Northeastern Region.
- To continue collecting phytoplankton and zooplankton from selected lakes.
- To investigate Chaoborous spp. as biological indicators of lake sensitivities and their relationships to selected chemical parameters.

phytoplankton - 3 times per year, composite samples are collected through to a depth of 2.5 times the Secchi disc reading.
zooplankton - 3 times per year, at major lake basins, single vertical hauls from 1m above bottom are obtained using a 80 micron mesh, 20 cm diameter opening, tow net.

Sampling was extended through 1983 in order to expand the data base. The reports have been written, reviewed & edited and are expected, in final form, by December 1985.

PROJECT NUMBER

139

SUBJECT CODE

2.3

LRTAP PROJECT DESCRIPTION

TITLE

Odour Production by Planktonic Algae in Softwater and Acidic Lakes

PRINCIPAL INVESTIGATOR

NAME: K.H. Nicholls

PHONE: (416) 248-3058

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment

ADDRESS: Aquatic Ecosystems Section
Ontario Ministry of the Environment
P.O. Box 213
Rexdale, Ontario
M9W 5L1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Department of Plant Sciences
University of Western Ontario
Dr. L. Brown

DURATION: 5 years

APPROXIMATE COST PER YEAR: \$33,000

PROJECT OBJECTIVES/DESCRIPTION

To determine factors controlling growth and odour production by Chrysochromulina, Synura and Uroglena species in softwater and acidic lakes.

- 1) Ecological-multivariate analyses
 - 12-15 lakes in Sudbury, Muskoka, Haliburton region, measurement of physical-chemical factors.
- 2) Laboratory
 - establish cultures, measure effects of altered conditions.

LRTAP PROJECT DESCRIPTIONTITLE

A Study of Lakes in Nova Scotia in Relation to Acid Deposition Effects on Plankton

PRINCIPAL INVESTIGATOR

NAME: Dr. Patricia A. Lane

PHONE: (902) 424-6527

AGENCY AND DEPARTMENT: Department of Biology

ADDRESS: Dalhousie University
Halifax, Nova Scotia
B3H 4J1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. Joseph J. Kerekes
Canadian Wildlife Service
Environment Canada
c/o Department of Biology
Dalhousie University

Dr. Anthony C. Blouin
Department of Biology
Dalhousie University
Halifax, Nova Scotia
B3H 4J1

DURATION: 1980-1984

APPROXIMATE COST PER YEAR: \$14,000

PROJECT OBJECTIVES/DESCRIPTION

- 1983-1984 Biogeographic survey of lake plankton in relation to pH range in Nova Scotia.
- 1982-1983 An experimental approach to understanding the effects of acid precipitation, liming, and nutrient enrichment on a lake plankton community.
- 1981-1982 Cause-effect relationships in planktonic food webs of lakes undergoing acid precipitation.
- 1980-1981 A zooplankton study of three lakes in Kejimikujik National Park in regard to acid precipitation.

PROJECT NUMBER

141

SUBJECT CODE

2.3

LRTAP PROJECT DESCRIPTION

TITLE

Aquatic Macrophytes of Acidic Waters in Nova Scotia

PRINCIPAL INVESTIGATOR

NAME: Bill Freedman

PHONE: (902) 424-3829

AGENCY AND DEPARTMENT: Institute for Environmental Studies and Department
of Biology

ADDRESS: Dalhousie University
Halifax, Nova Scotia
B3H 4J1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

C. Stewart, P.M. Catling, J. Kerekes
funding: Canadian Wildlife Service

DURATION: 1981-1984

APPROXIMATE COST PER YEAR: \$10,000

PROJECT OBJECTIVES/DESCRIPTION

To examine the relationships between water chemistry and colour and the occurrence of macrophyte species, and community productivity.

Report available:

Catling, P.M., B. Freedman, C. Stewart, J. Kerekes, and L.P. Lefkovitch. 1985. Aquatic plants of Kejimikujik National Park, Nova Scotia; floristic composition, relation to water chemistry, and new records. Canadian Journal of Botany (accepted for publication).

Kerekes, J., B. Freedman, and P. Clifford. 1984. Comparison of the characteristics of an acidic eutrophic, and an acidic oligotrophic lake near Halifax, N.S. Water Poll. Res. J. Can., 19: 1-10.

SUBJECT CODE

2.4

PROJECT NUMBER

142

LRTAP PROJECT DESCRIPTION

TITLE

Extensive Survey
MNR Fisheries Acidification Program

PRINCIPAL INVESTIGATOR

NAME: Donna Wales

PHONE: (416) 965-7887

AGENCY AND DEPARTMENT: Fisheries Branch
Ontario Ministry of Natural Resources

ADDRESS: Toronto, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

J. Matuszek
B. Keller and L. Maki, OMOE
K. Minns, DFO

DURATION: 5 years

APPROXIMATE COST PER YEAR: \$100,000

PROJECT OBJECTIVES/DESCRIPTION

To assess the current chemical and biological status of Ontario lakes with respect to acidic deposition through the collection of water chemistry and fish species composition data by synoptic surveys.

PROJECT NUMBER
143

SUBJECT CODE
2.4

LRTAP PROJECT DESCRIPTION

TITLE

Comparative Lakes Study
MNR Fisheries Acidification Program

PRINCIPAL INVESTIGATOR

NAME: Victor Liimatainen and John Gunn PHONE: (705) 522-7823

AGENCY AND DEPARTMENT: Ontario Ministry of Natural Resources

ADDRESS: P.O. Box 3500, Station "A"
Sudbury, Ontario
P3A 4S2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): B. Keller, Ontario Ministry of the Environment

DURATION: 3 years

APPROXIMATE COST PER YEAR: \$35,000

PROJECT OBJECTIVES/DESCRIPTION

To test laboratory derived toxicity thresholds of pH and Al under natural conditions through the collection and evaluation of data on relative abundance, age structure, growth, recruitment success, diet and levels of selected contaminants for populations of lake trout, brook trout, smallmouth bass and walleye.

SUBJECT CODE
2.4

PROJECT NUMBER
144

LRTAP PROJECT DESCRIPTION

TITLE

Hg Body Burdens in Fish
MNR Fisheries Acidification Program

PRINCIPAL INVESTIGATOR

NAME: P. Dimond

PHONE: (416) 965-7887

AGENCY AND DEPARTMENT: Fisheries Branch
Ontario Ministry of Natural Resources

ADDRESS: Toronto, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): G. Beggs, OMNR
W. Scheider, OMOE

DURATION: 5 years

APPROXIMATE COST PER YEAR: \$30,000

PROJECT OBJECTIVES/DESCRIPTION

To evaluate the relationships between the concentration of Hg in fish flesh and patterns of atmospheric deposition of acidity and lake water chemistry using data collected by the provincial contaminant monitoring program.

PROJECT NUMBER

145

SUBJECT CODE

2.4

LRTAP PROJECT DESCRIPTION

TITLE

Synthesis and Modelling of Fisheries Response to Acidification
MNR Fisheries Acidification Program

PRINCIPAL INVESTIGATOR

NAME: Gail Beggs

PHONE: (416) 965-7887

AGENCY AND DEPARTMENT: Fisheries Branch
Ontario Ministry of Natural Resources

ADDRESS: Toronto, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

J. MacLean, OMNR
K. Minns, DFO
ESSA, Toronto

DURATION: 5 years

APPROXIMATE COST PER YEAR: \$10,000-\$50,000

PROJECT OBJECTIVES/DESCRIPTION

To synthesize knowledge of the response of fish to acidification in models that can be used to predict the effect of acidification on fisheries resources in Ontario. To use modelling exercises to identify gaps in current understanding and guide future research.

LRTAP PROJECT DESCRIPTIONTITLE

Fish Contaminants in Poorly Buffered Ontario Lakes

PRINCIPAL INVESTIGATOR

NAME: K. Suns/W. Scheider

PHONE: (416) 248-3011

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Aquatic Contaminants Section
Water Resources Branch

ADDRESS: P.O. Box 213
125 Resources Road
Rexdale, Ontario
M9W 5L1

COOPERATIVE AGENCIES
AND INVESTIGATORS

(IF APPLICABLE): Ontario Ministry of Natural Resources

DURATION: 1985/1986 (possible extension to 1989/1990)

APPROXIMATE COST PER YEAR: \$45,000 (1985/1986)
- future funding unknown

PROJECT OBJECTIVES/DESCRIPTION

Hg and Pb residues in yearling yellow perch from lakes in Muskoka-Haliburton have been monitored since 1978. Using this data base, this project will investigate i) trends in metal residues overtime, ii) relationships between metal residues and water quality parameters, and iii) differences in perch metal residues in lakes subjected to differing deposition using data from Muskoka-Haliburton and two other areas of the province.

Between 1977 and 1984, Hg levels in adult sportfish from some 1,300 locations in the province were analyzed. Using this data base, the project will investigate broadscale relationships between Hg residues and acidic deposition, Hg residues and water quality parameters, and relationships between residues in adult sportfish versus juvenile perch.

PROJECT NUMBER

147

SUBJECT CODE

2.4

LRTAP PROJECT DESCRIPTION

TITLE

Fish Toxicology Studies

PRINCIPAL INVESTIGATOR

NAME: Dr. P.J. Dillon

PHONE: (705) 766-2412

AGENCY AND DEPARTMENT: Ontario Ministry of Environment
Water Resources Branch
Aquatic Ecosystems Section

ADDRESS: Dorset Research Centre
P.O. Box 39
Bellewood Acres Road
Dorset, Ontario
PO 1E0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1983/85

APPROXIMATE COST PER YEAR: \$205,000

PROJECT OBJECTIVES/DESCRIPTION

To develop lethal and sublethal thresholds of pH, Al and other metals for early life history stages for several fish species including laketrout, brooktrout, and rainbow trout, smallmouth bass and lake whitefish.

Field in-situ bioassays will be conducted over a wide range of water chemistry conditions. Exposures will range in duration from one day to five months.

Laboratory dose-response data will be developed for each species at a number of early life stages using continuous flow exposures.

Results will be used to model fish population responses to predicted changes in lake water chemistry due to acid deposition. (In cooperation with OMNR)

SUBJECT CODE

2.4

PROJECT NUMBER

148

LRTAP PROJECT DESCRIPTION

TITLE

Avoidance of Low pH and Elevated Al Concentrations by Lake Charr (Salvelinus namaycush) Embryos and Alevins
MNR Fisheries Acidification Program

PRINCIPAL INVESTIGATOR

NAME: John Gunn

PHONE: (416) 965-7887

AGENCY AND DEPARTMENT: Fisheries Branch
Ontario Ministry of Natural Resources

ADDRESS: Toronto, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. D.L.G. Noakes
Guelph University
Department of Zoology

DURATION: 2 years

APPROXIMATE COST PER YEAR: \$20,000

PROJECT OBJECTIVES/DESCRIPTION

To establish the ability of early life stages of lake charr to detect and avoid deleterious chemical conditions, typical of the "acid pulses" that accompany snowmelt.

PROJECT NUMBER
149

SUBJECT CODE
2.4

LRTAP PROJECT DESCRIPTION

TITLE

The Toxicity of H⁺ to Smallmouth Bass and Lake Whitefish
MNR Fisheries Acidification Program

PRINCIPAL INVESTIGATOR

NAME: P. Ihhsen and B. Shuter

PHONE: (416) 832-2761

AGENCY AND DEPARTMENT: Fisheries Research
Ontario Ministry of Natural Resources

ADDRESS: Maple, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 4 years

APPROXIMATE COST PER YEAR: \$25,000

PROJECT OBJECTIVES/DESCRIPTION

To determine how exposure to low pH affects the survival and development of lake whitefish embryos and the overwintering survival and elemental composition of young-of-the-year smallmouth bass.

DESCRIPTION DU PROJET DE TADPA

TITRE

Effets cellulaires des pluies acides chez le poisson

NOM DU CHERCHEUR RESPONSABLE: Gaston Chevalier PHONE: (514) 282-3342

MINISTRE, ORGANISME OU SERVICE:

ADRESSE: Gaston Chevalier
Dép. Sciences Biologiques
Université du Québec à Montréal
M.P. 8888, Montreal
Québec, Canada
H3C 3P2

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S):

DURÉE DE CHAQUE PHASE: 3 ans

COÛT APPROXIMATIF (PAR ANNÉE): \$25,000

OBJECTIFS DU PROJET ET DESCRIPTION

- Identifier les mécanismes d'adaptation endocrinienne de la truite nouchetée (Salvelinus fontinalis) exposés à des conditions variées d'acidité et d'aluminium.

DESCRIPTION DU PROJET DE TADPA

TITRE

Les précipitations acides et la survie du saumon atlantique: Essai de modelisation pour un bassin versant de la côte-nord du Saint-Laurent

NOM DU CHERCHEUR RESPONSABLE: Denis Brouard PHONE: (418) 843-2769

MINISTRE, ORGANISME OU SERVICE: Gilles Shooner et Associés

ADRESSE: 40, Racine, Lorette Ville
Quebec, G2B 1C6

COLLABORATEUR(S), INRS-Eau (Marius Lachance)
ORGANISME(S) ET CHERCHEUR(S):

DURÉE DE CHAQUE PHASE: 1 seule phase de 1 an

COÛT APPROXIMATIF (PAR ANNÉE): \$165,000

OBJECTIFS DU PROJET ET DESCRIPTION

- détermination de l'importance des diverses composantes biotiques et abiotiques dans la capacité de neutralisation des apports acides atmosphériques sur un bassin hydrographique de faible superficie (40 km²).
- mise au point d'un modèle prédictif permettant d'établir la relation entre les caractéristiques hydrobiologiques d'un bassin versant et la survie de Salmo solar.

DESCRIPTION DU PROJET DE TADPA

TITRE

Effet de l'acidité sur les communautés piscicoles du Pontiac-Témiscamingue

NOM DU CHERCHEUR RESPONSABLE:

Jean-Jacques Frenette

PHONE: (418) 643-2172

MINISTRE, ORGANISME OU SERVICE: Direction des relevés aquatiques
Ministère de l'Environnement du
Québec, (MENVIQ)

ADRESSE: 3900, rue Marly
Sainte-Foy, Québec
G1X 4E4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Yvon Richard

DURÉE DE CHAQUE PHASE: Phase 1, 2 et 3: 1985, Phases 4 et 5: 1986,
Phase 6: 1987

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Evaluer l'impact de l'acidité de 50 lacs du Pontiac-Témiscamingue sur le doré jaune, la truite grise et les espèces compagnes.

Phase 1 - Capturer des espèces de poisson de chaque lac au moyen de filets verticaux, de trappes et de nasses.

Phase 2 - Dissection de 50 spécimens par lac (ou les prises d'un effort de pêche) de truite grise et de doré jaune, mesures de longueur et de poids, prélèvement de contenus stomacaux, d'écaillés ou d'otolithes, ainsi que le dénombrement, longueur, poids et sexe des autres espèces.

Phase 3 - Détermination de la structure des populations.

Phase 4 - Pour chaque lac, détermination d'âge de 50 spécimens de doré jaune et de truite grise.

Phase 5 - Pour chaque lac, analyse de contenus stomacaux de 50 spécimens de doré jaune et de truite grise.

Phase 6 - Traitement et interprétation des résultats.

DESCRIPTION DU PROJET DE TADPA

TITRE

Effet de l'acidité sur la dynamique de populations de la faune piscicole de la région du Témiscamingue

NOM DU CHERCHEUR RESPONSABLE:

PHONE: (418) 643-2172

Jean-Jacques Frenette et Yvon Richard

MINISTRE, ORGANISME OU SERVICE: Direction des relevés aquatiques
Ministère de l'Environnement du
Québec, (MENVIQ)

ADRESSE: 3900, rue Marly
Sainte-Foy, Québec
G1X 4E4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Direction des Laboratoires, (MENVIQ)

DURÉE DE CHAQUE PHASE: Phase 1, et 2: 1984-85, Phase 3: 1986, 87, 88,
Phase 4: 1987- 88

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Etablir l'effet de l'acidité sur la dynamique des populations piscicoles, les structures de taille et d'âge, la croissance, la maturité sexuelle, la mortalité, la production, la distribution spatiale, ainsi que l'abondance des diverses espèces piscicoles évoluant dans un gradient de complexité spécifique.

Phase 1 - Choix de sept lacs, parmi les 17 lacs inventoriés en juin 1984.

Phase 2 - Capture et recapture des espèces de poissons de chaque lac.

Phase 3 - Détermination de l'âge d'environ 600 perchaudes, 300 brochets et 200 meuniers noirs.

Phase 4 - Traitement et interprétation des résultats.

DESCRIPTION DU PROJET DE TADPA

TITRE

Discrimination des facteurs biotiques et abiotiques responsables du niveau d'acidité de 8 lacs du Témiscamingue

NOM DU CHERCHEUR RESPONSABLE:

PHONE: (418) 643-2172

Jacques Dupont et Yves Grimard

MINISTRE, ORGANISME OU SERVICE: Direction des relevés aquatiques
Ministère de l'Environnement du
Québec, (MENVIQ)

ADRESSE: 3900, rue Marly
Sainte-Foy, Québec
G1X 4E4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Ministère des Loisirs, de la Chasse et de la
Pêche
Direction des laboratoires, (MENVIQ)

DURÉE DE CHAQUE PHASE: Phase 1: 1985, Phases 2, 3, et 4: 1986 et 87,
Phase 5: 1988

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Examiner et expliquer le gradient d'acidité et les effets sur la population des poissons que l'on retrouve dans les lacs du Témiscamingue situés sur une même assise géologique. Cette étude constitue une synthèse de plusieurs projets et nécessite la poursuite des sous-objectifs suivants:

Caractériser le niveau d'acidité de quelques lacs par un suivi physico-chimique temporel sur des bassins soumis à une même charge acide dans et situés dans un contexte géologique à priori similaire.

Discriminer les facteurs biotiques et abiotiques du bassin versant ou des lacs qui régissent ce niveau d'acidité.

Déterminer avec le plus grand degré de certitude possible, l'origine de l'acidité sur ces lacs.

Déterminer le seuil de tolérance des différentes espèces de poissons à l'acidité.

Phase 1 - Suivi physico-chimique des lacs sur un cycle annuel.

Phase 2 - Photo-interprétation des bassins versants.

Phase 3 - Inventaire biophysique des bassins versants et géochimique des sols.

Phase 4 - Etude hydrologique des bassins versants.

Phase 5 - Traitement et synthèse de l'information.

PROJECT NUMBER

155

SUBJECT CODE

2.4

LRTAP PROJECT DESCRIPTION

TITLE

Field Experimental Study for Genetic Adaptive Strategy on Salmon Eggs Development

PRINCIPAL INVESTIGATOR

NAME: Yan Vigneault/Chislain Verreault

PHONE: (418) 648-2508

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: Champlain Harbour Station
901 Cap Diamant, Box 15500
Quebec City, Quebec
G1K 7Y7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Bio-Conseil Inc.

DURATION: 1985/1990

APPROXIMATE COST PER YEAR: 1985-86 \$10,000 (feasibility study)
1986-90 \$40,000

PROJECT OBJECTIVES/DESCRIPTION

Determine the adaptiveness to acid conditions of a number of natural strain of Atlantic salmon and monitor embryonic development success in acidified rivers.

Study the mechanism which are responsible of the resistance of acidity in embryonic development.

SUBJECT CODE

2.4

PROJECT NUMBER

156

LRTAP PROJECT DESCRIPTION

TITLE

Tolerance to Acidification for Different Populations of Atlantic Salmons

PRINCIPAL INVESTIGATOR

NAME: Yan Vigneault/Chislain Verreault

PHONE: (418) 648-2508

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: Champlain Harbour Station
901 Cap Diamant, Box 15500
Quebec City, Quebec
G1K 7Y7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985/1990

APPROXIMATE COST PER YEAR: 1985-90 \$40,000

PROJECT OBJECTIVES/DESCRIPTION

Compare the resistance of diverse development stage of a few salmon populations of North Shore to an acid stress like spring pH depression.

Identify some resistant salmon populations that can be utilize in a mitigation program.

PROJECT NUMBER
157

SUBJECT CODE
2.4

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Episodic pH Decline on Reproduction and Survival of Brook Trout in Lake Laflamme (Watershed Study)

PRINCIPAL INVESTIGATOR

NAME: Yan Vigneault/Chislain Verreault

PHONE: (418) 648-2508

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: Champlain Harbour Station
901 Cap Diamant, Box 15500
Quebec City, Quebec
G1K 7Y7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Andree Labrecque (biologist consultant)

DURATION: 1984/1986

APPROXIMATE COST PER YEAR: \$30,000

PROJECT OBJECTIVES/DESCRIPTION

This project focus:

- on assessing the seasonal development cycle of eggs and fry of lake Laflamme brook trout population;
- on assessing spatio-temporal variability of chemical parameters collected on spawning site (underground and surface water quality);
- on assessing chemical biological relations observed on spawning sites during spring runoff.

SUBJECT CODE
2.4

PROJECT NUMBER
158

LRTAP PROJECT DESCRIPTION

TITLE

Influence of Trace Ions on Tolerance of Atlantic Salmon Alevins to Low pH

PRINCIPAL INVESTIGATOR

NAME: Richard H. Peterson

PHONE: (506) 529-8854

AGENCY AND DEPARTMENT: Department of Fisheries and Oceans

ADDRESS: Biological Station,
St. Andrews, New Brunswick
EOG 2X0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: several years

APPROXIMATE COST PER YEAR: \$10,000

PROJECT OBJECTIVES/DESCRIPTION

Atlantic salmon alevins are maintained from hatching to terminal yolk resorption in solutions of varying pH and with additions of varying amounts of Ca^{2+} , Mg^{2+} and trace metals (Mn^{2+} , Fe^{3+} , Al^{3+}) to determine the influence of these factors on tolerance of alevins to pH.

LRTAP PROJECT DESCRIPTION

TITLE

Behavioral Responses of Salmonid Fishes to pH Gradients

PRINCIPAL INVESTIGATOR

NAME: Richard H. Peterson

PHONE: (506) 529-8854

AGENCY AND DEPARTMENT: Department of Fisheries and Oceans

ADDRESS: Biological Station,
St. Andrews, New Brunswick
EOG 2X0

COOPERATIVE AGENCIES University of New Brunswick (Dr. U. Paim)
AND INVESTIGATORS Ms. Karen Coombs
(IF APPLICABLE):

DURATION: Terminates in 1986

APPROXIMATE COST PER YEAR: \$6,000

PROJECT OBJECTIVES/DESCRIPTION

The avoidance/preference responses of brook trout and Atlantic salmon to experimental pH gradients are being investigated. Gradients of pH 4.0-8.0 are generated by titration of acidified, de-carbonated water with NaOH as it flows through the gradient apparatus.

SUBJECT CODE

2.4

PROJECT NUMBER

160

LRTAP PROJECT DESCRIPTION

TITLE

Zoogeographic Distribution of Freshwater Fish Species

PRINCIPAL INVESTIGATOR

NAME: W.J. White

PHONE: (902) 426-3576

AGENCY AND DEPARTMENT: Department of Fisheries and Oceans
Fisheries Research Branch

ADDRESS: P.O. Box 550
Halifax, N.S. B3J 2S7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Two years

APPROXIMATE COST PER YEAR: \$5,000

PROJECT OBJECTIVES/DESCRIPTION

Survey approximately 80 Nova Scotian lakes for which fish zoographic information is available from before 1960. Lake water chemistries will also be compared.

The objective is to compare current zoogeographical distributions of freshwater fish species with distributions before 1960 and to determine whether any changes in distribution can be related to declining pH's.

PROJECT NUMBER

161

SUBJECT CODE

2.5

LRTAP PROJECT DESCRIPTION

TITLE

Baseline Lake Water Quality Data Collection

PRINCIPAL INVESTIGATOR

NAME: L.G. Swain

PHONE: (604) 387-4441 (ext. 258)

AGENCY AND DEPARTMENT: Resource Quality Section
Water Management Branch

ADDRESS: B.C. Ministry of Environment
765 Broughton Street
Victoria, B.C.
V8V 1X5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): J.A. Balkwill - Fisheries Branch
B.C. Ministry of Environment

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$25,000

PROJECT OBJECTIVES/DESCRIPTION

Approximately 100 lakes per year are visited, and water samples collected to provide background data on lake water quality. Most of these lakes have never had water quality analyses conducted on them before. Analyses performed depend upon suspected sensitivity (based upon lake sensitivity maps prepared in 1984), with those lakes in suspected high or moderate sensitivity areas having more extensive analyses conducted than those of low sensitivity.

SUBJECT CODE
2.5

PROJECT NUMBER
162

LRTAP PROJECT DESCRIPTION

TITLE

Pacific Region DFO Acid Rain Program

PRINCIPAL INVESTIGATOR

NAME: S.C. Samis

PHONE: (604) 666-0280

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: 1090 West Pender Street
Vancouver, B.C.
V6E 2P1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985-1986

APPROXIMATE COST PER YEAR: \$20,000

PROJECT OBJECTIVES/DESCRIPTION

Baseline sensitivity monitoring of surface waters supporting Pacific salmon, involving weekly/monthly water chemistry analyses of key streams downwind of Vancouver and Northwestern Washington industrial and vehicular emissions sources.

PROJECT NUMBER
163

SUBJECT CODE
2.5

LRTAP PROJECT DESCRIPTION

TITLE

Lake Water Chemistry for Small Lakes in Southern Saskatchewan

PRINCIPAL INVESTIGATOR

NAME: Mr. Larry Lechner

PHONE: (306) 787-6195

AGENCY AND DEPARTMENT: Saskatchewan Environment

ADDRESS: 3085 Albert Street
Regina, Saskatchewan
S4S 0B1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Saskatchewan Research Council

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$5,000

PROJECT OBJECTIVES/DESCRIPTION

Collect water chemistry data in data sparse area of southern Saskatchewan to produce lake sensitivity maps for Saskatchewan and to monitor acidification trends in the long term (if any).

-Method:

Sample about 30 lakes in southern Saskatchewan once per year in the summer at one metre depth.

SUBJECT CODE
2.5

PROJECT NUMBER
164

LRTAP PROJECT DESCRIPTION

TITLE

Lake Water Chemistry for Small Lakes in Northern Saskatchewan

PRINCIPAL INVESTIGATOR

NAME: Mr. Larry Lechner

PHONE: (306) 787-6195

AGENCY AND DEPARTMENT: Saskatchewan Environment

ADDRESS: 3085 Albert Street
Regina, Saskatchewan
S4S 0B1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Environment Canada
Saskatchewan Research Council

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$10,000

PROJECT OBJECTIVES/DESCRIPTION

- collect water chemistry data in data sparse areas of northern Saskatchewan
- determine sensitivity of lakes to acid deposition
- detect trends towards acidification (if any)

METHOD :

- sample 22 lakes in northern Saskatchewan once per year in the summer at one metre depth.

PROJECT NUMBER
165

SUBJECT CODE
2.5

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Acidification on Lake and Stream Chemistry and Biology

PRINCIPAL INVESTIGATOR

NAME: Dr. P.J. Dillon

PHONE: (705) 766-2412

AGENCY AND DEPARTMENT: Ontario Ministry of Environment
Water Resources Branch
Aquatic Ecosystems Section

ADDRESS: Dorset Research Centre
P.O. Box 39
Bellwood Acres Road
Dorset, Ontario
POA 1E0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: ongoing; reports prepared as data warrant

APPROXIMATE COST PER YEAR: \$330,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the long-term effects of the input of acids on the chemistry and biology of lakes and streams and the short-term effects of individual events of high loading.

The chemistry, phytoplankton, zooplankton, benthos and fisheries of eight study lakes and of varying alkalinities (20 to 200 eq l⁻¹) have been studied since 1976. Intensive studies of several streams (chemistry and periphyton) are undertaken each year during peak runoff.

Eventually, some of the cause-effect relationships linking acidic precipitation and metal deposition to changes in the chemistry and biology of lakes will be quantified, so that measurements at a point in time will be useful for predicting the degree of acidification of the water body.

SUBJECT CODE
2.5

PROJECT NUMBER
166

LRTAP PROJECT DESCRIPTION

TITLE

Water Quality Monitoring of Lakes in the Greater Sudbury Area

PRINCIPAL INVESTIGATOR

NAME: W. Keller

PHONE: (705) 675-4501

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Northeastern Region

ADDRESS: 199 Larch Street
Sudbury, Ontario
P3E 5P9

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. R.J. Pitblado
Laurentian University
(in Data Analysis phase)

DURATION: Annual Surveys in 1981, 1982, 1983, 1984, 1985

APPROXIMATE COST PER YEAR: approx. \$20,000

PROJECT OBJECTIVES/DESCRIPTION

1. To collect yearly data on 50 acidic lakes within approximately 200 km of the Sudbury smelting centre to permit comparison with the results of earlier surveys.
2. To identify temporal changes in water quality which have occurred due to changes in regional atmospheric deposition.

The project entails single midsummer sampling of 50 lakes which represent a subset of 250 lakes surveyed during a more extensive program conducted in 1981-1983 in order to provide ongoing monitoring of water quality in Sudbury area lakes affected by smelter emissions.

PROJECT NUMBER

167

SUBJECT CODE

2.5

LRTAP PROJECT DESCRIPTION

TITLE

Trend Through Time Study
MNR Fisheries Acidification Program

PRINCIPAL INVESTIGATOR

NAME: Tom Stewart

PHONE: (416) 766-2212

AGENCY AND DEPARTMENT: Ontario Ministry of Natural Resources
Algonquin Region

ADDRESS: Huntsville, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

P. Dillon, OMOE, Dorset, Ontario
F. Hicks, OMNR, Whitney, Ontario
G. Beggs, Fisheries Branch. OMNR, Ontario

DURATION: 5 years

APPROXIMATE COST PER YEAR: \$150,000

PROJECT OBJECTIVES/DESCRIPTION

To establish a baseline quantitative description of fish community composition and population characteristics of major fish species (relative abundance, age, growth, diet, mortality rates, reproductive success, harvest, etc.) in 15 low alkalinity lakes (40 uEqL^{-1}) and to assess how the community changes in response to acidification and other stresses.

SUBJECT CODE
2.5

PROJECT NUMBER
168

LRTAP PROJECT DESCRIPTION

TITLE

Filamentous Algae as Biomonitors for Aluminum and Manganese: A Feasibility Study

PRINCIPAL INVESTIGATOR

NAME: Pamela Stokes

PHONE: (416) 978-6576

AGENCY AND DEPARTMENT: Environmental Studies and Department of Botany
University of Toronto

ADDRESS: Haultain Building
University of Toronto
Toronto, Ontario
M5S 1A4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Professor Peter Campbell
INRS-Eau
Université de Québec
Ste-Foy, Québec

DURATION: 2 years

APPROXIMATE COST PER YEAR: \$14,000

PROJECT OBJECTIVES/DESCRIPTION

Laboratory calibration of the uptake kinetics of Al and Mn by standard cultures of the filamentous algae Mougeotia and Spirogyra isolated from acidic lakes, with parallel determinations of the chemical forms of Mn and Al, and calculation of the theoretical forms of the metals in the defined medium.

The hypothesis to be tested is that of the algae will "see" only from the "free" forms of the metals, although a time course of uptake could result in saturation of available sites on the algal cells.

The ultimate objective is to use the laboratory-grown algae as monitors of available metal in field situations where chemical determinations may not be practicable. This can be applied to situations where metals are suspected as being a problem, or to 'recovery' situations.

NUMÉRO DE PROJET
169

CODE DU SUJET
2.5

DESCRIPTION DU PROJET DE TADPA

TITRE

Réseau de surveillance de l'acidification des lacs du Québec

NOM DU CHERCHEUR RESPONSABLE: Paul Potvin

PHONE: (418) 644-3290

MINISTRE, ORGANISME OU SERVICE: Service des relevés aquatiques
Ministère de l'Environnement du Québec,
(MENVIQ)

ADRESSE: 2700, rue Einstein
Sainte-Foy, Québec
G1X 4E4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Direction des laboratoires, (MENVIQ)

DURÉE DE CHAQUE PHASE: Début 1980 - sur une base continue, Phase 2, 3: début
1986, phase 4: 1988

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Suivre l'évolution physico-chimique de l'acidification des lacs dans les zones les plus susceptibles du Québec.

Phase 1 - Complément à la couverture spatiale des caractéristiques physico-chimiques des lacs du Québec.

Phase 2 - Identification des zones les plus susceptibles et choix des lacs à surveiller.

Phase 3 - Échantillonnage et analyse des paramètres reliés à l'acidification des eaux lacustres.

Phase 4 - Traitement et interprétation des données.

SUBJECT CODE
2.5

PROJECT NUMBER
170

LRTAP PROJECT DESCRIPTION

TITLE

Monitoring of Water Quality in North Shore Rivers (Quebec)

PRINCIPAL INVESTIGATOR

NAME: Yan Vigneault / Chislain Verreault

PHONE: (418) 648-2508

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: Champlain Harbour Station
901 Cap Diamant, Box 15500
Quebec City, Quebec
G1K 7Y7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$45,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the actual level of acidity on 15 rivers of the Lower, Middle and Upper North Shore of St-Lawrence river.

To monitor chemical changes that have occurred as a result of acidification and to observe the rate of progress.

To assess the possible effects of acid precipitation on Atlantic salmon habitat.

LRTAP PROJECT DESCRIPTION

TITLE

Ecological Monitoring on North Shore Salmon Rivers

PRINCIPAL INVESTIGATOR

NAME: Yan Vigneault / Chislain Verreault

PHONE: (418) 648-2508

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: Champlain Harbour Station
901 Cap Diamant, Box 15500
Quebec City, Quebec
G1K 7Y7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Andre Ahern, Andree Labrecque (biologist consultants)

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$130,000

PROJECT OBJECTIVES/DESCRIPTION

This project focus:

- on monitoring biological changes and chemical changes that have occurred as a result of acidification and to observe the rate of progress;
- on assessing the possible adaptation of aquatic communities (benthos, bacteria-fungi) according to a gradient scale of acidification in North Shore rivers;
- on assessing the possible effects of acidification on mortality rate of salmon populations (eggs and fry).

SUBJECT CODE
2.5

PROJECT NUMBER
172

LRTAP PROJECT DESCRIPTION

TITLE

Operation and Evaluation of LRTAP Surface Water Quality Network - Quebec Section

PRINCIPAL INVESTIGATOR

NAME: John Haemmerli

PHONE: (418) 648-3921

AGENCY AND DEPARTMENT: Inland Waters Directorate, Quebec Region
Environmental Conservation Service, Environment Canada

ADDRESS: 1141, Route de l'Eglise - 8th Floor
Ste-Foy, Quebec
G1V 4H5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Water Surveys Section, Q&Q Division, Longueuil
Laboratory Section, Q&Q Division, Longueuil,
NWRI Laboratory, Burlington
P. Brooksbank - Monitoring & Surveys Division
Water Quality Branch, IWD, Ottawa

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$97,000

PROJECT OBJECTIVES/DESCRIPTION

- Sample lakes in the LRTAP surface water quality network, with field quality control (work done by Water Surveys Section, Water Quality and Quantity Division)
- Analyse samples at the Longueuil laboratory, metals at the Burlington lab
- Validate and enter data in AQWALABS and then NAQUADAT
- Assess basic assumptions and network performance
- Evaluate year-to-year changes
- Seek uniformity with other regions
- Produce evaluation report on the LRTAP network
- Produce complete information files on each of the lakes in the network

Methods:

- Sampling from helicopters for 2 to 6 days every two months
- Analysis of samples at Longueuil lab (metals at Burlington lab) by methods given in Analytical Methods Manual, Environment Canada, 1981
- Statistical analyses of results, annual values, annual changes, formatting for subsequent analysis (determination of trends)

PROJECT NUMBER
173

SUBJECT CODE
2.5

LRTAP PROJECT DESCRIPTION

TITLE

LRTAP Lake and Stream Monitoring

PRINCIPAL INVESTIGATOR

NAME: G. Howell

PHONE: (506) 388-6606

AGENCY AND DEPARTMENT: Inland Waters Directorate, Water Quality Branch
Environmental Conservation Service, Environment Canada

ADDRESS: P.O. Box 861
Moncton, New Brunswick
E1C 8N6

COOPERATIVE AGENCIES Water Resources Branch
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$77,000

PROJECT OBJECTIVES/DESCRIPTION

To provide consistent water quality data sets which are amenable to statistical analysis for long-term trends LRTAP associated parameters.

Methods:

Seventy-eight lakes located in Southwestern Nova Scotia and in Newfoundland are sampled by helicopter during the spring and fall. Twenty-seven rivers located in the four Atlantic Provinces are sampled on a monthly basis.

SUBJECT CODE

2.5

PROJECT NUMBER

174

LRTAP PROJECT DESCRIPTION

TITLE

Natural and anthropogenic acidification of Nova Scotian lakes

PRINCIPAL INVESTIGATOR

NAME: J.K. Underwood, Ph.D.

PHONE: (902) 424-5300

AGENCY AND DEPARTMENT: Nova Scotia Department of the Environment

ADDRESS: P.O. Box 2107
Halifax, Nova Scotia

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Dr. E. Gorham, University Minnesota

DURATION: 1985-86

APPROXIMATE COST PER YEAR: \$25,000

PROJECT OBJECTIVES/DESCRIPTION

Acidification of Nova Scotian lakes results from a mixture of natural and anthropogenic influences. Gradients of deposition of SO_4 are available for study across the province, providing opportunities to investigate these phenomena. The steepest gradient in the province occurs within about 30 km. of Halifax, where SO_4 deposition increases from background (approx. 20 kg/ha^{-1}) to over 40 kg ha^{-1} . Trends in SO_4 concentrations in lakes resemble the precipitation gradients. H^+ is influenced by both SO_4 and organic acids.

PROJECT NUMBER

175

SUBJECT CODE

2.5

LRTAP PROJECT DESCRIPTION

TITLE

Monitoring Acidified Atlantic Salmon Rivers

PRINCIPAL INVESTIGATOR

NAME: Walton D. Watt

PHONE: (902) 426-3606

AGENCY AND DEPARTMENT: Department of Fisheries and Oceans
Fisheries Research Branch

ADDRESS: P.O. Box 550
Halifax, N.S. B3J 2S7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$50,000

PROJECT OBJECTIVES/DESCRIPTION

To chart the progress of future acidification and/or monitor the effectiveness of an emission controls program.

This is the minimum river monitoring program that is still likely to provide useful data for monitoring freshwater fish, especially Atlantic salmon, responses to increasing or declining acid precipitation input to the salmon rivers in southwest Nova Scotia.

1. Monthly chemical monitoring at one station near the river's mouth for:
 - (a) Two control rivers of pH 5.4.
 - (b) Four rivers of pH 4.7 where juvenile Atlantic salmon are still (1984) known to be present.
 - (c) Two rivers of pH 4.7 where salmon runs are probably extinct, but restocking can be undertaken as soon as the acid toxicity is cleared up.
2. The biological monitoring in all rivers to consist of annual quantitative electrofishing at a minimum of three stations per river to monitor the species present and the population densities.

SUBJECT CODE
2.5

PROJECT NUMBER
176

LRTAP PROJECT DESCRIPTION

TITLE

Monitoring of Lakes and Rivers on the South Coast of Insular Newfoundland

PRINCIPAL INVESTIGATOR

NAME: D.A. Scruton

PHONE: (709) 702-4485

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: P.O. Box 5667
St. John's, Newfoundland
A1C 5X1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)

Environmental Chemistry Laboratory,
Victoria Public Hospital, Halifax, Nova Scotia
Mr. Geoff Howell, Environment Canada, Water Quality
Branch, Moncton, New Brunswick

DURATION: Ongoing (since 1981)

APPROXIMATE COST PER YEAR: \$10,000

PROJECT OBJECTIVES/DESCRIPTION

To monitor freshwater chemistry in an acid sensitive and high deposition region of insular Newfoundland

The monitoring network currently consists of 20 rivers and 20 lakes on the south coastal region of insular Newfoundland. These sites are visited from two to four time per year corresponding to late fall and spring high-discharge conditions and mid-summer and mid-winter low flow conditions. A one-liter grab sample is collected for analysis for major physical and chemical parameters while a 125-ml sample (acid fixed) is collected for metals analysis. Water analysis is completed under contract.

PROJECT NUMBER

177

SUBJECT CODE

2.5

LRTAP PROJECT DESCRIPTION

TITLE

Biological Monitoring of Lakes and Rivers in Insular Newfoundland

PRINCIPAL INVESTIGATOR

NAME: D.A. Scruton

PHONE: (709) 772-4485

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: P.O. Box 5667
St. John's, Newfoundland
P.O. Box 213
A1C 5X1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

LGL Ltd. St. John's, Newfoundland
Mr. Geoff Howell, Environment Canada,
Water Quality Branch, Moncton, New Brunswick

DURATION: 1985 - 1990

APPROXIMATE COST PER YEAR: \$60,000

PROJECT OBJECTIVES/DESCRIPTION

To determine temporal variability in selected biological parameters sensitive to the effects of anthropogenic pollution. Trends are to be evaluated in the context of natural variability and in relation to current and future emissions scenarios.

Four watersheds were selected for biomonitoring with two lakes and three stream sites established in each watershed. Fish are sampled from study lakes using multiple gear types so as to permit an evaluation of population size, age structure, growth, condition, etc. Lake morphometry was investigated and plankton samples (for community structure analysis) are also collected. Fish populations at stream sites are evaluated using electrofishing methods. Chemistry will be evaluated from two to four times per year. A more refined program is anticipated once Department of Fisheries and Oceans establishes monitoring protocol.

SUBJECT CODE

2.5

PROJECT NUMBER

178

LRTAP PROJECT DESCRIPTIONTITLE

In-System Variability in Key Water Quality Parameters in Major River Drainages in Insular Newfoundland

PRINCIPAL INVESTIGATORNAME: D.A. ScrutonPHONE: (709) 772-4485AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: P.O. Box 5667
St. John's, Newfoundland
P.O. Box 213
A1C 5X1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Environmental Chemistry Laboratory,
Victoria Public Hospital, Halifax, Nova Scotia

DURATION: 1985 - 1986APPROXIMATE COST PER YEAR: \$10,000PROJECT OBJECTIVES/DESCRIPTION

To evaluate the variability in water chemistry within major river drainages and to establish the major determinants of this variability.

Thirty sites (lake and stream) were sampled in each of three major river drainages to evaluate variance in acidity, buffering capacity, as well as marine, organic, and anthropogenic influences. Influence of drainage order, elevation, slope and other biophysical factors will be investigated. Temporal variability will be determined at sites selected for biomonitoring.

PROJECT NUMBER
179

SUBJECT CODE
2.5

LRTAP PROJECT DESCRIPTION

TITLE

Surface Water Monitoring for LRTAP Assessment

PRINCIPAL INVESTIGATOR

NAME: Peter Brooksbank

PHONE: (819) 997-3422

AGENCY AND DEPARTMENT: Inland Waters Directorate, Quebec Region
Environmental Conservation Service, Environment Canada

ADDRESS: Place Vincent Massey
351 St. Joseph Blvd
Ottawa, Ontario
K1a 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Ontario Ministry of the Environment
Department of Fisheries and Oceans

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$36,000

PROJECT OBJECTIVES/DESCRIPTION

To develop and coordinate a surface water chemistry monitor network for Eastern Canada, capable of defining rates of changes in aquatic regime major ion and trace metal content.

Methods:

A monitoring network consisting of lakes and rivers in the Atlantic Region and lakes in Quebec Region commenced operation during 1983. In Ontario, data from three intensive study sites will be used for monitoring purposes. These will be supplemented with additional data from the Ontario Ministry of Environment and Ministry of Natural Resources. All Data will be stored on NAQUADAT.

SUBJECT CODE
2.5

PROJECT NUMBER
180

LRTAP PROJECT DESCRIPTION

TITLE

NAQUADAT Data Base

PRINCIPAL INVESTIGATOR

NAME: Dr. S.H. Whitlow, Raymond Lemieux

PHONE: (819) 997-3422

AGENCY AND DEPARTMENT: Inland Waters Directorate, Quebec Region
Environmental Conservation Service, Environment Canada

ADDRESS: Place Vincent Massey
351 St. Joseph Blvd
Ottawa, Ontario
K1a 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$18,500

PROJECT OBJECTIVES/DESCRIPTION

To update and maintain a satisfactory water quality database management in support of the LRTAP program.

Methods:

Data from the LRTAP Water Quality Monitoring sites, and other Water quality data useful to the LRTAP program will be added to the NAQUADAT Data Base. This data will be inventoried and made available as requested.

PROJECT NUMBER
181

SUBJECT CODE
2.6

LRTAP PROJECT DESCRIPTION

TITLE

Analysis of Trace Levels of Aluminum Using Differential Pulse Polarography and Atomic Absorption Spectroscopy

PRINCIPAL INVESTIGATOR

NAME: K.E. Johnson

PHONE: (306) 584-4012

AGENCY AND DEPARTMENT: Department of Chemistry
University of Regina

ADDRESS: Regina, Saskatchewan
S4S 0A2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

A.K. Brechta, Msc. student

DURATION: From 1982

APPROXIMATE COST PER YEAR: \$ 7,000

PROJECT OBJECTIVES/DESCRIPTION

It has been shown that AA spectroscopy with the Hitachi 180-80 in the furnace mode will measure Al in solution to the 3 ppb (g/L) level.

Differential pulse polarography applied to the acid alizarin violet N complex allowed measurement of electroactive Al to the 100 ppb level or better in the presence of a 10-fold excess of Fe (III). This aspect of the work, using the Metrohm 626, is being refined.

The overall objective is to distinguish between free Al^{3+} , the supposed toxic species, and total Al in solution.

SECTION 3

TERRESTRIAL EFFECTS

LRTAP PROJECT DESCRIPTIONTITLE

Effects of Acidic Deposition on Forest Soils in Northwestern Ontario

PRINCIPAL INVESTIGATOR

NAME: Dr. H. Dennis Griffin

PHONE: (807) 475-1215

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Northwestern Region

ADDRESS: P.O. Box 5000
Thunder Bay, Ontario
P7C 5G6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Contract:
Senes Consultants Ltd.
499 McNicoll Avenue
Willowdale, Ontario
M2H 2C9

Cooperating agency:
Phytotoxicology Section
Air Resources Branch
Ontario Ministry of the
Environment
(Dr. S.N. Linzon)

DURATION: Indefinite

APPROXIMATE COST PER YEAR: \$ 8,500

PROJECT OBJECTIVES/DESCRIPTION

Establish baseline status for chemical constituents and physical properties in forest soils in northwestern Ontario. Conduct accelerated leaching experiments on selected forest soils.

Determine long-term changes in open-top soil columns. Map soils with respect to sensitivity to acidification. Approximately 65 sites sampled in 1981 and 1982. Additional sites to be sampled in 1986. Install open-top soil columns containing different soil types at four Ontario sites. Determine soil sensitivity criteria, based on leaching experiments and other studies.

Baseline soil sampling may enable future changes caused by long-range atmospheric deposition to be detected. Leaching experiments may provide an estimate for the number of years for precipitation currently deposited on northwestern Ontario to affect soils and vegetation. Open-top soil columns will provide an indication of long-term changes in soils exposed to natural precipitation/deposition in Ontario. Soil sensitivity map should be useful in indicating potential impact of acidic deposition on forest productivity and aquatic environment.

PROJECT NUMBER
183

SUBJECT CODE
3.1

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Simulated Acid Precipitation on Composition of Percolate from
Reconstructed Profiles of Two Northern Ontario Forest Soils

PRINCIPAL INVESTIGATOR

NAME: Dr. I.K. Morrison

PHONE: (705) 949-9461

AGENCY AND DEPARTMENT: Department of Agriculture
Canadian Forestry Service

ADDRESS: Great Lakes Forest Research Centre
P.O. Box 490
Sault Ste. Marie, Ontario
P6A 5M7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1977 - 1987

APPROXIMATE COST PER YEAR: \$ 5,000, including salaries

PROJECT OBJECTIVES/DESCRIPTION

To compare products of leaching, chiefly bases, H^+ -ion and SO_4^{--} -ion from reconstructed profiles of two northern Ontario forest soils under different regimes of dilute H_2SO_4 addition.

To compare effects of different dilute H_2SO_4 addition on soil chemical properties.

Two soils (a podzol and a brunisol, both from beneath mid-age jack pine forest) were reconstructed into 100 cm high column lysimeters. Dilute H_2SO_4 ranging in pH from 5.6 to 2.0, but at environmentally realistic rate, i.e., 1000 mm/annum has been dripped to each of the 24 columns weekly since mid-1977. Volumes are measured weekly; monthly the following are determined on the percolates: pH, specific conductance, K^+ , Ca^{++} , Mg^{++} , Na^+ , several trace metals, SO_4^{--} . At the culmination of the experiment soil will be analysed by horizons.

Time course of SO_4^{--} retention, then movement is followed in relation to loading together with time-course of cation transport.

LRTAP PROJECT DESCRIPTIONTITLE

Impact of Acid Deposition on Forest Soils

PRINCIPAL INVESTIGATOR

NAME: Dr. N.W. Foster

PHONE: (705) 949-9461

AGENCY AND DEPARTMENT: Department of Agriculture
Canadian Forestry Service

ADDRESS: Great Lakes Forest Research Centre
P.O. Box 490
Sault Ste. Marie, Ontario
P6A 5M7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

OMNR, Sault Ste. Marie District
DOE, Inland Waters Directorate
DFO, Great Lakes Bioliminology Laboratory

DURATION: 1980 - 1990

APPROXIMATE COST PER YEAR: \$ 37,000 + PY (Prof) and 2 PY (Tech)

PROJECT OBJECTIVES/DESCRIPTION

- a) To elucidate the influence of atmospheric deposition of acidifying substances upon soil chemical properties and processes
- b) To elucidate the modifying influence of forest soil on properties of percolating acid precipitation

Ion fluxes in precipitation, throughfall, forest floor percolate, stemflow, and streamflow, since 1980, and mineral soil percolate, since 1982, have been determined in a small catchment with shallow till supporting sugar maple-yellow birch forests at Turkey Lakes Watershed. Nutrients, major ions, and trace metals were determined on an 'event basis' through 1984 and monthly since then. Field studies have been supported by laboratory examination of the reactions of nitrogen and sulphur in soil.

PROJECT NUMBER
185

SUBJECT CODE
3.1

LRTAP PROJECT DESCRIPTION

TITLE

Nitrate, Sulphate and Hydrogen Saturation of an Acidic Soil (Podzol)

PRINCIPAL INVESTIGATOR

NAME: Dr. Gilles Robitaille
Robert Boutin

PHONE: (418) 648-5826
(418) 648-5825

AGENCY AND DEPARTMENT: Canadian Forestry Service

ADDRESS: Laurentian Forest Research Centre
1055 PEPS Street
C.P. 3800, Ste. Foy
Quebec
G1V 4C7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 3 years

APPROXIMATE COST PER YEAR: \$ 7,000

PROJECT OBJECTIVES/DESCRIPTION

These series of laboratory experiments were designed to give information on nutrient depletion from the soil exchange sites. In a phase I experiment a gradient of SO_4^{2-} and H^+ was applied to a reconstituted profile. In a phase 2, experiment NO_3 was added to the former. The amendments were added to organic horizons on the one hand and inorganic horizons supported by lower mineral horizons on the other hand. Soils were analysed before and after amendments. Leachates were analysed on a weekly basis.

Anticipated Results:

These experiments will give us information on:

- the depletion of nutrients from a low nutrient acid podzol for various loadings of SO_4^{2-} , NO_3 , and H^+
- mobilization of nutrient in a podzol due to the amendment
- nutrient movement from mineralization potential of the organic horizons
- leading potential of a podzol
- mobilization of Al^{3+} , Mg^{2+} and Mn^{2+}
- modifications in soil exchange acidity, internal acidification

SUBJECT CODE

3.1

PROJECT NUMBER

186

LRTAP PROJECT DESCRIPTION

TITLE

Changes in the Fertility Status of a Podzol Supporting Jack Pine

PRINCIPAL INVESTIGATOR:

NAME: Dr. Gilles Robitaille
Robert Boutin
T.D. Phu

PHONE: (418) 648-5826
(418) 648-5825
(418) 648-5839

AGENCY AND DEPARTMENT: Canadian Forestry Service

ADDRESS: Laurentian Forest Research Centre
1055 PEPS Street
C.P. 3800, Ste. Foy
Quebec
G1V 4C7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 2 years

APPROXIMATE COST PER YEAR: \$ 4,000

PROJECT OBJECTIVES/DESCRIPTION

This project was designed to benefit from the data obtained from a study done in 1977 on soil fertility and needle nutrient status of jack pine. In 1985, a resampling of sites was done. Fertility comparisons are to be made. Further sampling is to be done in 1986.

PROJECT NUMBER

187

SUBJECT CODE

3.1

LRTAP PROJECT DESCRIPTION

TITLE

Soil Susceptibility to Acid Rain in New Brunswick

PRINCIPAL INVESTIGATOR

NAME: H. Van Groenewoud

PHONE: (506) 452-3581

AGENCY AND DEPARTMENT: Canadian Forestry Service - Maritimes

ADDRESS: P.O. Box 4000
Fredericton, New Brunswick
E3B 5P7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1989

APPROXIMATE COST PER YEAR: \$ 3,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the best possible method to evaluate the susceptibility of different forest soils.

To apply this method to different soils developed on different regolith systems to rate these soils for their susceptibility.

SUBJECT CODE

3.1

PROJECT NUMBER

188

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Acidity on Soil Chemical Properties

PRINCIPAL INVESTIGATOR

NAME: Dr. S.S. Singh

PHONE: (613) 995-3700

AGENCY AND DEPARTMENT: Research Branch, Agriculture Canada

ADDRESS: Chemistry & Biology Research Institute
K.W. Neatby Building
Ottawa, Ontario K1A 0C6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Not yet determined

APPROXIMATE COST PER YEAR: \$ 50,000

PROJECT OBJECTIVES/DESCRIPTION

Assess the effects of acidity on soil chemical properties.

PROJECT NUMBER

189

SUBJECT CODE

3.1

LRTAP PROJECT DESCRIPTION

TITLE

Quantifying the Chemical Effects of Acid Rain on Glacial Derived Sediments and their Soils: Development, Application, and Results of Comprehensive Tests

PRINCIPAL INVESTIGATOR

NAME: W.W. Shilts

PHONE: (819) 995-4523

AGENCY AND DEPARTMENT: Geological Survey of Canada
Department of Energy, Mines and Resources

ADDRESS: 601 Booth Street
Ottawa, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

P. Wyatt (contractor)

DURATION: One year

APPROXIMATE COST PER YEAR: \$ 25,000

PROJECT OBJECTIVES/DESCRIPTION

Developing techniques for calculating acid neutralizing capability in surficial sediments.

SUBJECT CODE

3.1

PROJECT NUMBER

190

LRTAP PROJECT DESCRIPTION

TITLE

Natural Distribution Pattern of Trace Elements and Carbonate Content of Glacial Drift

PRINCIPAL INVESTIGATOR

NAME: W.W. Shilts

PHONE: (819) 995-4523

AGENCY AND DEPARTMENT: Geological Survey of Canada
Department of Energy, Mines and Resources

ADDRESS: 601 Booth Street
Ottawa, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: One year

APPROXIMATE COST PER YEAR: \$ 10,000

PROJECT OBJECTIVES/DESCRIPTION

Investigation of trace elements and carbonate content in surficial geological materials in areas of the eastern townships of Quebec.

PROJECT NUMBER
191

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Comparison of Tree Ring Chemistry and Changes in Growth Rates in Areas Impacted by "Acid Rain" in Southwestern British Columbia

PRINCIPAL INVESTIGATOR

NAME: John P. Senyk

PHONE: (604) 388-0688

AGENCY AND DEPARTMENT: Pacific Forestry Centre
Canadian Forestry Service
506 West Burnside Road
Victoria, B.C. V8Z 1M5

ADDRESS:

COOPERATIVE AGENCIES B.C. Environment
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 5 years

APPROXIMATE COST PER YEAR: \$ 5,800

PROJECT OBJECTIVES/DESCRIPTION

To identify changes in tree growth rates, if any, and analyze growth rings for trace element accumulation and wood density - derive historic deposition patterns and compare or relate these to any changes in growth rates.

LRTAP PROJECT DESCRIPTION

TITLE

Impacts of Air Pollution Mixtures on Forest Vegetation and Soils

PRINCIPAL INVESTIGATOR

NAME: Dr. G. Singleton

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division
14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. P.A. Addison
Canadian Forestry Service
Environment Canada
5820 - 122 Street
Edmonton, Alberta T6A 3F5

DURATION: 1976- 1985

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

The study involved both controlled environment and field research to describe the impact on plant species of a pollution mixture characteristics of Oil Sands operations. It will also develop a predictive capability for changes in forest soils and vegetation at current and predicted rates of pollution deposition in the Oil Sands area.

PROJECT NUMBER
193

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Nutrient Redistribution in Jackpine as an Indication of Acid Deposition Stress

PRINCIPAL INVESTIGATOR

NAME: Dr. G. Singleton

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division
14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. H. Legge
Kananaskis Centre for Environmental Research
University of Calgary
Calgary, Alberta

DURATION: 1984

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

The feasibility of using non-destructive analytical methods (proton induced x-ray emissions) to detect changes in tree wood chemistry is to be examined. Tree cores will be analyzed for temporal nutrient changes and related to the emissions of oil sands plants in the Fort McMurray area.

LRTAP PROJECT DESCRIPTION

TITLE

Atmosphere-Biosphere Interface

PRINCIPAL INVESTIGATOR

NAME: Dr. G. Singleton

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division
14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Dr. M. Nosal
Department of Mathematics and Statistics
University of Calgary
Calgary, Alberta

DURATION: 1981- 1985

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

This project consists of several sub-projects which assess methods of relating ground level concentrations of SO₂ to plant growth. A model has been developed which has shown possibilities in relating growth of soybeans and lodgepole pine to SO₂. Current work will attempt to relate jackpine growth (annual tree rings) to modelled SO₂ levels in the oil sands region of northeastern Alberta.

PROJECT NUMBER
195

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Physiological Effect of Low Concentrations of NO_x on Alberta Plant Species

PRINCIPAL INVESTIGATOR

NAME: Dr. G. Singleton

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division
14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. H. Legge
Kananaskis Centre for Environmental Research
University of Calgary
Calgary, Alberta

DURATION: 1980 - 1985

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

The project will determine through fumigation studies and field experiments the sensitivity of selected plant species to injury by low concentrations of NO and/or NO₂. In addition, the ability of certain plant species to acclimate to low concentrations of nitrogen oxides will be investigated. The effects of NO_x/SO₂ and NO_x/H₂S mixtures on plant species will be considered.

LRTAP PROJECT DESCRIPTION

TITLE

The Effect of SO₂ Emitted from a Sour Gas Plant on the Development of Endomycorrhizas (VA) on Phleum pratense L

PRINCIPAL INVESTIGATOR

NAME: Dr. G. Singleton

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division

ADDRESS: 14th Floor, Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Ms. J. Clapperton
University of Calgary

DURATION: 1984 - 1985

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

The physiological effects of sulphur dioxide (SO₂) on Phleum pratense L will be related to the subsequent effect on endomycorrhizas (VA) inhabiting the roots of this agriculturally important species. Laboratory fumigation and field site experiments over a two year period will be used to monitor the effects on mycorrhizal root infection, root biomass and root exudation.

PROJECT NUMBER
197

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Protection of the Biotic Environment

PRINCIPAL INVESTIGATOR

NAME: Dr. G. Singleton

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division
14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Dr. E. Pielou
University of Lethbridge
Department of Botany
Lethbridge, Alberta

DURATION: 1982 - 1984

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

The primary objective of this project is to attempt to isolate the effects of aerial emissions on the forest ecosystems from natural environmental effects. The total biomass of aspen within an area 70 km x 35 km centred on the Suncor plant will be estimated so as to judge the relative importance of productivity of the three chief temporally fluctuating conditions (tent caterpillar, fire and air pollution), and the constant environmental conditions, such as soil type, slope and aspect.

LRTAP PROJECT DESCRIPTIONTITLE

Effects of Deposition of Acid Forming Substances on Organic Matter
Decomposition/Nutrient Cycling in a Forest Ecosystem

PRINCIPAL INVESTIGATOR

NAME: Dr. G. Singleton

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division
14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. D. Parkinson
Kananaskis Centre for Environmental Research
University of Calgary
Calgary, Alberta

DURATION: 1984- 1986

APPROXIMATE COST PER YEAR:PROJECT OBJECTIVES/DESCRIPTION

This research effort will determine the effects of deposition of acid forming substances on:

- 1) organic matter decomposition
- 2) distribution and leaching characteristics of key nutrients in the litter/soil system
- 3) the uptake of nutrients by mycorrhizal and non-mycorrhizal jackpine seedlings will be studied

PROJECT NUMBER

199

SUBJECT CODE

3.2

LRTAP PROJECT DESCRIPTION**TITLE**

Assessment of Air Pollution Impact on Forest Systems

PRINCIPAL INVESTIGATION**NAME:** Paul A. Addison
Doug G. Maynard**PHONE:** (403) 435-7210**AGENCY AND DEPARTMENT:** Canadian Forestry Service**ADDRESS:** Northern Forest Research Centre
5320 - 122 Street
Edmonton, Alberta
T6H 3S5**COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):** Canterra Energy Ltd.
Gulf Canada**DURATION:** 5 years 1981 -1986**APPROXIMATE COST PER YEAR:** \$ 70,000 excluding salaries**PROJECT OBJECTIVES/DESCRIPTION**

Describe and assess changes in the forest ecosystem as a result of two sour gas plants in west-central Alberta (in cooperation with Dr. D.G. Maynard).

Determine the mechanism of elemental sulfur dust impact to the soil plant system (Maynard and Addison).

LRTAP PROJECT DESCRIPTIONTITLE

Effects of Acidic Precipitation on Saskatchewan Crops and Forest Species

PRINCIPAL INVESTIGATOR

NAME: Dr. Z.M. Abouguendia

PHONE: (306) 664-8185

AGENCY AND DEPARTMENT: Saskatchewan Research Council

ADDRESS: 30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)

Saskatchewan Environment
Saskatchewan Power Corporation

DURATION: August 1985 - July 1986

APPROXIMATE COST PER YEAR: \$40,000

PROJECT OBJECTIVES/DESCRIPTION

To assess the relative sensitivity of aspen, white spruce, wheat, barley and alfalfa to simulated acidic precipitation.

To determine the threshold for direct injury of the species studied.

To evaluate changes in soil chemical and physical characteristics resulting from the acidic precipitation.

PROJECT NUMBER
201

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Increase in Rain Acidity on Tree Diseases

PRINCIPAL INVESTIGATOR

NAME: Dr. R.D. Whitney

PHONE: (705) 949-9461

AGENCY AND DEPARTMENT: Department of Agriculture
Canadian Forestry Service

ADDRESS: Great Lakes Forest Research Centre
P.O. Box 490
Sault Ste. Marie, Ontario
P6A 5M7

COOPERATIVE AGENCIES Ontario Ministry of Natural Resources
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985 - 1989

APPROXIMATE COST PER YEAR: \$ 10,000 + .3 PY (Prof) and .4 PY (Tech)

PROJECT OBJECTIVES/DESCRIPTION

To determine the effects of simulated acid rain on selected tree diseases by:

- a) Examining the infection success and growth rate of Armillaria sp. inoculated in the roots of trees exposed to simulated rainfall of varying pHs
- b) In the same controlled experiment to monitor other diseases and mycorrhizae occurring naturally on the treated trees

On an area of approximately 3 ha near Randolph Lake in Rose Township, some 80 km east of Sault Ste. Marie, 75 balsam fir saplings, 2 m high, which have been inoculated with Armillaria obscura, are being treated bi-weekly to simulated rain of 3 pHs. Sixty of the trees are protected from natural precipitation with plastic 'tents'. Infection success and rate of growth of Armillaria obscura in the roots will be determined after two growing seasons.

LRTAP PROJECT DESCRIPTION

TITLE

Forest Productivity and Decline Studies

PRINCIPAL INVESTIGATOR

NAME: S.N. Linzon, D.L. McLaughlin,
D.E. Dimma, and W.D. McIlveen

PHONE: (416) 965-4516

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch
Phytotoxicology Section

ADDRESS: 800 Bay Street, Suite 347
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Ontario Ministry of Natural Resources
Ontario Ministry of Agriculture and Food

DURATION: Program continuous

APPROXIMATE COST PER YEAR: \$ 268,000 (1985/1986)

PROJECT OBJECTIVES/DESCRIPTION

To determine the role that acidic precipitation is playing in the decline of sugar maples in the Muskoka area of Ontario.

To determine the incidence of hardwood decline across Ontario and monitor future changes.

To conduct a dendrochronology study to develop regional growth chronologies for sugar maple which can be related to anthropogenic and natural environmental factors.

To compare current forest stand growth in both coniferous and hardwood woodlots with historical data collected in the Muskoka-Haliburton area.

PROJECT NUMBER
203

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Acidic Precipitation Simulants on Vegetation Under Greenhouse and Field Conditions

PRINCIPAL INVESTIGATOR

NAME: A.L. Kuja and A.J. Enyedi
(Dr. S.N. Linzon, Supervisor)

PHONE: (416) 456-2504

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch
Phytotoxicology Section

ADDRESS: Heart Lake Road
Brampton, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Ontario Ministry of Natural Resources
Ontario Ministry of Agriculture and Food

DURATION: Program continuous

APPROXIMATE COST PER YEAR: \$132,000 (1985/1986)

PROJECT OBJECTIVES/DESCRIPTION

To determine possible detrimental effects of simulated acidic precipitation on yield of agricultural crops and productivity of commercially valuable forest species using greenhouse rain simulation chambers and automated field systems consisting of mobile exclusion canopies for excluding ambient rain and applying rain simulants.

To document foliar injury and relate these to symptoms observed in the field.

To determine sensitivity of cultivars of different crop species.

To determine possible interactions between acid rain and O₃ and SO₂ on crops and trees.

LRTAP PROJECT DESCRIPTIONTITLE

Effects of Ozone and Other Gaseous and Particulate Pollutants on Vegetation

PRINCIPAL INVESTIGATOR

NAME: Douglas P. Ormrod

PHONE: (519) 824-4120
ext. #3036

AGENCY AND DEPARTMENT: University of Guelph
Department of Horticultural Science

ADDRESS: Guelph, Ontario
N1G 2W1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)

Supported by NSERC, Ontario
Ministry of the Environment
Environment Canada

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$100,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the effects of single and mixed gaseous and particulate pollutants on plants with emphasis on growth and yield responses, mechanisms of action, and methodology.

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Acidic Deposition on Forest Vegetation in Northwestern Ontario

PRINCIPAL INVESTIGATOR

NAME: Dr. H. Dennis Griffin

PHONE: (807) 475-1215

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Northwestern Region

ADDRESS: P.O. Box 5000
Thunder Bay, Ontario
P7C 5G6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)

Contractor:
Senes Consultants Ltd.
499 McNicoll Avenue
Willowdale, Ontario
M2H 2C9

Cooperating Agency:
Phytotoxicology Section
Air Resources Branch
Ontario Ministry of the
Environment
(Dr. S.N. Linzon)

DURATION: 1) Baseline sampling: Indefinite.
2) Watershed study: 5 years (approx.)

APPROXIMATE COST PER YEAR: \$250,000

PROJECT OBJECTIVES/DESCRIPTION

Establish baseline status for chemical constituents of vegetation in northwestern Ontario. Document changes in elemental distribution and nutrient cycling within a boreal forest ecosystem.

Approximately 55 sites sampled in 1981 and 1982. Repeat sampling scheduled for 1986 and 1987.

A watershed study area of approximately 80 hectares has been selected at a location about 40 kilometers northwest of Thunder Bay. Intensive monitoring commenced at this site in 1983, including measurements of SO₂, O₃, NO_x and meteorological data, incident precipitation, precipitation throughfall and stemflow, litterfall, soil leachate, groundwater and surface water outflow.

Baseline vegetation sampling should enable future changes caused by long-range atmospheric deposition to be detected. Biogeochemical studies at the watershed will assist in understanding the effects of acidification on a mixed-forest ecosystem in northwestern Ontario.

LRTAP PROJECT DESCRIPTIONTITLE

Impact of Acid Deposition on Forest Productivity

PRINCIPAL INVESTIGATOR

NAME: Dr. I.K. Morrison

PHONE: (705) 949-9461

AGENCY AND DEPARTMENT: Department of Agriculture
Canadian Forestry Service

ADDRESS: Great Lakes Forest Research Centre
P.O. Box 490
Sault Ste. Marie, Ontario
P6A 5M7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DOE, Inland Waters Directorate
DFO, Great Lakes Biolimnology Laboratory
(Dr. J.R.M. Kelso)
(OMNR, Sault Ste. Marie District)

DURATION: 1980 - 1987

APPROXIMATE COST PER YEAR: \$ 70,000, including salaries

PROJECT OBJECTIVES/DESCRIPTION

To elucidate the influence of atmospheric deposition of acidifying substances upon production and turnover processes within the vegetation of forest ecosystems.

To elucidate the modifying influence of the vegetation of forest ecosystems on precipitation properties.

To participate in the development of process models involving forest growth and biogeochemical processes.

Study is being carried out on three main study sites in old-growth hard maple-yellow birch woods, Algoma District, Ontario, and closely coordinated with those of Dr. N. Foster and Dr. J. Nicolson. Growth is being measured on large numbers of PSPs; correlation with soil chemical factors will be attempted. Standing crop biomass and bioelement reserves have been estimated. Transfer in litter is being ascertained by studies of litterfall and litter chemistry (transfer in by throughfall, stemflow being studied by colleagues). Studies of litter decomposition rate in relation to acid treatment are being undertaken.

Data, together with those of colleagues, will be used to test and calibrate processes relating acid deposition and productivity of northern Ontario old-grown hardwood forest.

LRTAP PROJECT DESCRIPTION

TITLE

Impact of Acid Deposition on Forest Hydrologic Processes

PRINCIPAL INVESTIGATOR

NAME: Dr. J.A. Nicolson

PHONE: (705) 949-9461

AGENCY AND DEPARTMENT: Department of Agriculture
Canadian Forestry Service

ADDRESS: Great Lakes Forest Research Centre
P.O. Box 490
Sault Ste. Marie, Ontario
P6A 5M7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): DOE, Inland Waters Directorate
OMNR, Sault Ste. Marie District

DURATION: July 1980 - 1990

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

To elucidate the influence of atmospheric deposition of acidifying substances upon the hydrochemical cycle and the export of elements from forested catchments through the collection of water samples and the measurement of runoff volumes.

In an old-growth hard maple-yellow birch watershed on shallow till soils (Turkey Lake Forest Watershed).

- a) Fourteen small (2-63 ha) watersheds have been established and are sampled on a regular basis.
- b) Six additional watersheds are sampled and flow measured periodically.
- c) Twelve plots have been established in one basin where sampling is done to study the partitioning of both the volume and chemistry of gross precipitation within the forest ecosystem.
- d) Chemical analysis of all samples is carried out in the Great Lakes Forest Research Centre laboratory.

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Environmental Chemistry on Tree Form and Function in Natural and Managed Systems with Emphasis on Impacts of Atmospheric Pollution

PRINCIPAL INVESTIGATOR

NAME: Dr. G.D. Hogan

PHONE: (705) 949-9461

AGENCY AND DEPARTMENT: Department of Agriculture
Canadian Forestry Service

ADDRESS: Great Lakes Forest Research Centre
P.O. Box 490
Sault Ste. Marie, Ontario
P6A 5M7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

OMNR, Research Branch, OMNR Sault Ste. Marie and
Blind River Districts

DURATION: 1984 - 1990

APPROXIMATE COST PER YEAR: \$ 20,000 + 1 PY (Prof) and 1 PY (Tech)

PROJECT OBJECTIVES/DESCRIPTION

To study the direct physiological response of forest species to simulated acid rain.

To study the effects of simulated acid rain on growth, carbon fixation and the leaching of nutrients from foliar material.

LRTAP PROJECT DESCRIPTION**TITLE**

The Neutralizing Ability and Response of Leaf Surfaces to Acidic Deposition

PRINCIPAL INVESTIGATOR

NAME: Professor T.C. Hutchinson

PHONE: (416) 978-4283

AGENCY AND DEPARTMENT: Department of botany and
Institute for Environmental Studies
University of Toronto

ADDRESS: Institute for Environmental Studies
Haultain Building
University of Toronto
Toronto, Ontario
M5S 1A4

**COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)**

NSERC
Dr. Simon Caporn, Ms. Cindy Adams and Ms. Brigitte Gaber

DURATION: 1983 - 1987

APPROXIMATE COST PER YEAR: \$ 40,000

PROJECT OBJECTIVES/DESCRIPTION

The study involves determinations of the ability of leaf surfaces of both crops and native species to neutralize acidic droplets falling on their surface. Relationships between leaf surface morphology and leaf surface wetability as factors influencing neutralization are being examined. Droplets placed on leaf surfaces in the field and in the greenhouse are being chemically analysed at intervals after the experiment is started to determine what substances are involved in this neutralization. The relationship between leaf surface chemistry and the sensitivity of different species to acid rain damage, including alterations photosynthesis are being examined.

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Experimental Acidification on Boreal Forest Vegetation

PRINCIPAL INVESTIGATOR

NAME: Professor T.C. Hutchinson

PHONE: (416) 978-4283

AGENCY AND DEPARTMENT: Department of Botany and
Institute for Environmental Studies
University of Toronto

ADDRESS: Institute for Environmental Studies
Haultain Building
University of Toronto
Toronto, Ontario M5S 1A4

COOPERATIVE AGENCIES Canadian National Sportsman's Fund and NSERC
AND INVESTIGATORS
(IF APPLICABLE): Dr. Martha Scott and Mr. Murray Dixon

DURATION: Experimental acidification - 1981-1985

APPROXIMATE COST PER YEAR: \$ 35,000

PROJECT OBJECTIVES/DESCRIPTION

The study involves 5 years of deliberate acid rain simulations at monthly intervals during the growing season at three contrasting sites in mature jack pine forests near Kirkland Lake. The focus is on the ground flora and soil. Various growth parameters have been determined for feather mosses, lichens and herbaceous plants. Photosynthesis is being examined after sprays. Additional parameters include rates of litter decomposition, changes in soil solution chemistry and changes in soil microbial populations. Five years of sprays have been applied and a further five years of monitoring will be carried out.

PROJECT NUMBER
211

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Aluminum Toxicity on Coniferous Seedlings

PRINCIPAL INVESTIGATOR

NAME: Professor T.C. Hutchinson

PHONE: (416) 978-4283

AGENCY AND DEPARTMENT: Department of Botany and
Institute for Environmental Studies
University of Toronto

ADDRESS: Institute for Environmental Studies
Haultain Building
University of Toronto
Toronto, Ontario
M5S 1A4

COOPERATIVE AGENCIES NSERC and Canadian Forestry Service
AND INVESTIGATORS
(IF APPLICABLE) Dr. Magda Havas and Ms. Leah Bozic

DURATION: 1983 - 1987

APPROXIMATE COST PER YEAR: \$ 15,000

PROJECT OBJECTIVES/DESCRIPTION

Using the sand culture, the responses to Aluminum of five economically important coniferous species in eastern Canada have been investigated. Aluminum concentrations as high as 160 ppm have been used, all supplied in a nutrient solution at pH 3.8. Growth and elemental composition of the plants has been determined. Anatomical studies, using histochemical staining techniques, have been used to examine Aluminum localization in the root systems of jack pine. In addition, x-ray probe and SEM techniques have been used for confirmatory determinations. The studies are being related to levels of Aluminum occurring in soil solutions in the field.

LRTAP PROJECT DESCRIPTION

TITLE

Studies of the Role of Plant Nutrition and Soil Chemistry in Sugar Maple Decline

PRINCIPAL INVESTIGATOR

NAME: Professor T.C. Hutchinson

PHONE: (416) 978-4283

AGENCY AND DEPARTMENT: Department of Botany
and Institute for Environmental Studies
University of Toronto

ADDRESS: Institute for Environmental Studies
Haultain Building
University of Toronto
Toronto, Ontario
M5S 1A4

COOPERATIVE AGENCIES NSERC
AND INVESTIGATORS
(IF APPLICABLE): Mr. Craig Kinch and Ms. Cindy Adams

DURATION: 1985 - 1988

APPROXIMATE COST PER YEAR: \$20,000

PROJECT OBJECTIVES/DESCRIPTION

To determine through analyses of foliage and soil solutions whether sugar maple trees at various sites in Ontario and Quebec, which are showing dieback, have common occurrences of nutritional disorders, either due to nutrient deficiencies or toxicities. The study will also include bio-assays of soils from affected and unaffected woodlots which will be amended with various nutrient applications. Several plant species will be used for these bio-assays.

PROJECT NUMBER
213

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Decline and Mortality in Maple Bushes in Quebec

PRINCIPAL INVESTIGATOR

NAME: G. Gagnon

PHONE: (418) 643-7606

AGENCY AND DEPARTMENT: Ministère de l'Energie et des Ressources de Quebec

ADDRESS: Research Division
Forestry Section
2700 Einstein
Ste. Foy, Quebec
G1P 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION:

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

To identify causes of the decline affecting the sugar bushes; to verify the extent of the declining; to determine if the mortality rate is increasing, stabilizing or declining; to propose corrective forestry management measures.

During the summers of 1983 and 1984 about 149 sample plots were established in Beauce, Megantic, Frontenac and Arthabaska counties. In every plot, dendrometric, pathological, entomological and ecological (soil, drainage, vegetation, etc.) measurements were taken. An evaluation questionnaire was filled out with the owner of each sugar bush, on management practices, infestation by carterpillars, defoliation, refoilation and mortality of the trees. Last summer (1984) a reevaluation of the decline was done in the sample plots established in 1983. The helicopter survey carried out during the summer of 1983 in the zone most affected by maple decline has been extended to an adjacent sector to the south west.

A reevaluation of the decline will be done in the 149 sample plots established in 1983 and 1984. A helicopter survey will be carried out on the south shore of the Saint-Lawrence River, between the western limit of Kamouraska county and the Richelieu River. About 100 new sample plots will be established outside the area already studied and the emphasis will be placed on the resampling of soil profiles analysed more than ten years ago.

LRTAP PROJECT DESCRIPTIONTITLE

The Decline and Nutritional Status of Sugar Maple Stands in the Appalachian Region

PRINCIPAL INVESTIGATOR

NAME: Dr. B. Bernier

PHONE: (418) 656-2327

AGENCY AND DEPARTMENT: Laval University, Faculty of Forestry

ADDRESS: Ste. Foy, Quebec

COOPERATIVE AGENCIESAND INVESTIGATORS(IF APPLICABLE):

Minister de l'Energie et des Ressources de Quebec

DURATION:APPROXIMATE COST PER YEAR:PROJECT OBJECTIVES/DESCRIPTION

To contribute in identifying causes of maple decline. To evaluate the implications of the main characteristics (biophysical elements, utilization) of sugar bushes as predisposing factors to decline with special regard to the nutritional aspect. To characterise more precisely sugar bushes that are sensitive or resistant to disturbances. To prescribe management practices for sugar bushes.

This study is divided in three parts:

- i) A special attention has been given to nutritive status. Nutrient content to the leaves (69 sites), humus layer and soil (51 sites) have been analysed. Sampling covers the whole range of decline classes.
- ii) The quantity of nutrients restituted to the soil by the litterfall and the throughfall has been measured in 10 sugar bushes.
- iii) An experiment with fertilization is also underway in five sugar bushes to verify the possibility of re-establishing the nutritioal balance and reducing the impact of a major stress like defoliation.

PROJECT NUMBER
215

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Evaluating the Impact of Simulated Acid Rain on Germination and Growth of Nursery Seedings

PRINCIPAL INVESTIGATOR

NAME: Jean-pierre Carpentier, Denis Laflamme PHONE: (418) 643-7606

AGENCY AND DEPARTMENT: Ministere de l'Energie et des Ressources

ADDRESS: Research Division
Forestry Section
2700 Einstein Street
Ste. Foy, Quebec
G1P 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION:

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

To determine the effects of simulated acid rain (H_2SO_4) on the germination and growth of black spruce, white spruce and sugar maple in three nurseries. The effects on the soils will also be verified.

In each nursery, five treatments have been applied at the rate of three replicates for each treatment. The pH of simulated rain were 5,6 (control) 4,0, 3,5, 3,0, 2,5. Sprinkling lasted for 60 minutes and was repeated once a week during 15 weeks. A good part of soil, tissue and water analyses has been done.

The experiment is being repeated this year with a few technical modifications.

LRTAP PROJECT DESCRIPTION

TITLE

Evaluating the Damages of Atmospheric Pollutants on Crops

PRINCIPAL INVESTIGATOR

NAME: Bruno Maltais

PHONE: (418) 643-2348

AGENCY AND DEPARTMENT: Ministère de l'Agriculture, des Pêcheries et de
l'Alimentation du Québec

ADDRESS: 2700 Einstein Street
Ste. Foy, Quebec
G1P 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Ministère de l'Environnement du Québec

DURATION:

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

To determine the effects of ozone and SO₂ crops; to measure the concentration of ozone in a rural location; to elaborate mathematical models of the dispersion of atmospheric pollutants in rural areas.

Three rural sites have been chosen in the Montréal région: Saint-Hyacinthe, Sainte-Clothilde and l'Assomption. Apparatus for monitoring ozone have been installed and calibrated by the Québec Ministry of Environment. Tobacco, tomato, potato, bean, etc... are used as sensitive crop species.

In each site, the concentration of ozone will be measured, the injuries to the sensitive species will be evaluated and the symptoms will be described. An inventory of crop damages will be undertaken in the region and the affected zone delimited. The part of this project concerning SO₂ will be realized next year in Rouyn-Noranda region.

DESCRIPTION DU PROJET DE TADPA

TITRE

Evaluation de l'impact des précipitations acides simulées sur la germination et la croissance de semis en pépinière

NOM DU CHERCHEUR RESPONSABLE: Denis Laflamme

PHONE: (418) 643-7994

MINISTRE, ORGANISME OU SERVICE: Service de la recherche
Ministère de l'Energie et des Ressources

ADRESSE: 2700, rue Einstein
Sainte-Foy, Québec
G1P 3W8

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S):

DURÉE DE CHAQUE PHASE: Début 1984...

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Evaluer l'impact de pluies acides simulées sur la germination et la croissance de l'épinette noire, l'épinette blanche et l'érable à sucre.

Phase 1 - Application de cinq traitements de pluies simulées à cinq pH différents.

Phase 2 - Evaluation des effets sur le taux de germination, sur la croissance ou la couleur des semis.

Phase 3 - Analyses chimiques des sols et des tissus.

LRTAP PROJECT DESCRIPTIONTITLE

Effects of Al, Mn, Mg Gradients Under Various Acidity Regimes on the Development
- Function of Ectomycorhyza of Balsam Fir

PRINCIPAL INVESTIGATOR

NAME: Dr. Gilles Robitaille

PHONE: (418) 648-5826

AGENCY AND DEPARTMENT: Canadian Forestry Service

ADDRESS: Laurentian Forest Research Centre
1055 PEPS Street
C.P. 3800, Ste. Foy
Quebec
G1V 4C7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Canadian Forestry Service Sponsorship to Dr. A. Fortin,
Dr. C. Camire, Dr. Y. Laflamme
Laval University

DURATION: 2 years 1985 - 1986

APPROXIMATE COST PER YEAR: \$ 90,000

PROJECT OBJECTIVES/DESCRIPTION

Both field and laboratory experiments are used to observed effects on the mycorhyza. An adjunct is a study on the effects of organic matter decomposition and nutrient leaching from the soil profile. The latter observations are related to the former potential effects. In the laboratory mycorhyzal inoculated roots are used as experimental while in the field mycorhyzal free transplants are used for growth effect observations.

Anticipated Results:

- synergism between acidity and metal gradients on development and function of mycorhyza, that would affect the growth of balsam fir
- treatment effect on the absorption of phosphorus, potassium, calcium and magnesium
- treatment effect on organic matter decomposition and hence possible perturbation of the cycling of nutrients need for growth.

PROJECT NUMBER
219

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Nutrient Movement in a Declining Sugar Maple Stand in Quebec

PRINCIPAL INVESTIGATOR

NAMEZ: Dr. Gilles Robitaille

PHONE: (418) 648-5826

AGENCY AND DEPARTMENT: Canadian Forestry Service

ADDRESS: Laurentian Forest Research Centre
1055 PEPS Streett
C.P. 3800, Ste. Foy
Quebec
G1V 4C7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Dr. B. Bernier
Laval University

DURATION: 3 years

APPROXIMATE COST PER YEAR: \$3,000

PROJECT OBJECTIVES/DESCRIPTION

This project is a collaborative effort between researchers at Laval University and CFS. The project on nutrient movement and storage was initiated by B. Bernier. CFS expertise was then sought by B. Bernier in order to complete the nutrient cycling and storage picture. The project is similar in methodology to that described in the biogeochemical investigation but on a much reduced scale.

SUBJECT CODE
3.2

PROJECT NUMBER
220

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Aluminum, Oxalic Acid, Calcium and pH and the Resulting Speciation of Aluminum on the Growth and Element Uptake of Black Spruce

PRINCIPAL INVESTIGATOR

NAME: Dr. P.A. Arp

PHONE: (506) 452-3581

AGENCY AND DEPARTMENT: University of New Brunswick
Department of Forest Resources

ADDRESS: Bag Service Number 44555
Fredericton, N.B.
E3B 6C2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Canadian Forestry Service
Maritimes Forestry Centre
P.O. Box 4000
Fredericton, N.B. E3B 5P7
(M.K. Mahendrapa, Scientific Authority)

DURATION: June 1983- June 1986

APPROXIMATE COST PER YEAR: \$69,700

PROJECT OBJECTIVES/DESCRIPTION

Several experiments were done to determine the effects of total concentrations of aluminum, oxalic acid, calcium, pH, and the resulting chemical speciation of aluminum in sand cultures on the growth and elemental uptake of black spruce (*Picea mariana* [Mill.] B.S.P.) seedlings.

The experiments with black spruce seedlings revealed that increasing the total concentration of Al in the growth medium reduced plant growth as well as the P and Ca uptake of the shoots, but K uptake was enhanced. Additions of oxalic acid to the growth media had a negative effect on seedling growth while Al uptake was generally reduced, and K, Ca, P, and S uptake were increased. The Ca concentration and pH of the growth medium did not affect seedling growth. Seedling growth was negatively related to S uptake.

A detailed analysis of the chemical speciation of the growth media indicated that the chemical speciation of a given element affected not only its bio-availability but also the uptake of other elements. Individual chemical species, in addition, had distinct effects on specific seedling responses. Plant growth, however, was not related to chemical speciation of any of the elements studied.

PROJECT NUMBER
221

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Investigation of Sugar Maple Decline in New Brunswick

PRINCIPAL INVESTIGATOR

NAME: Don O'Brien

PHONE: (506) 453-3711

AGENCY AND DEPARTMENT: N.B. Department of Natural Resources

ADDRESS: P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Environment New Brunswick
Canadian Forestry Service

DURATION:

APPROXIMATE COST PER YEAR: \$ 2,000

PROJECT OBJECTIVES/DESCRIPTION

Preliminary study of the extent to which maple decline is a significant factor in sugar bushes in New Brunswick.

Questionnaire for property owners distributed in 1985.

Results of the survey will be used to determine if further study will be required.

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Ozone on Commercial Potato Crops in New Brunswick

PRINCIPAL INVESTIGATOR

NAME: Jane Tims

PHONE: (506) 453-2669

AGENCY AND DEPARTMENT: Environmental Services Branch
Environment New Brunswick

ADDRESS: P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE) N. B. Department of Agriculture and Rural Development
Agriculture Canada

DURATION: 1984 - 1987

APPROXIMATE COST PER YEAR: \$ 3,000

PROJECT OBJECTIVES/DESCRIPTION

To assess the visible effects of ozone to commercially grown potatoes in New Brunswick.

Inspectors of agriculture departments record the incidence of ozone injury observed during regular potato crop inspections.

Three incidents of ozone injury were recorded in 1984.

Ozone is monitored at two urban locations (in Saint John) and at one rural location (Hampton).

Ozone levels at these locations frequently exceed maximum acceptable concentrations.

PROJECT NUMBER
223

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Air Pollution Effects on Reproductive Processes in Forest Plants

PRINCIPAL INVESTIGATOR

NAME: R.M. Cox

PHONE: (506) 452-3532

AGENCY AND DEPARTMENT: Canadian Forestry Service - Maritimes

ADDRESS: Maritimes Forest Research Centre
P.O. Box 4000
Fredericton, N.B.
E3B 5P7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985 - 1990

APPROXIMATE COST PER YEAR: 30,000 (excluding salaries)

PROJECT OBJECTIVES/DESCRIPTION

To determine paternal and maternal influences in the sensitivity of the reproductive processes of forest plants to simulate air pollution in relation to habitat factors.

Methods:

- 1) Determine and relate variation of pollen response to acidity and trace elements within and between population with different site characteristics (base status).
- 2) Determine pH and buffering capacity of pollination droplets and stigmatic surfaces in populations with different site characteristics.
- 3) Initiate the development of gas delivery system to supply SO₂ and O₃ to small open topped branch tip fumigation chambers to test in vivo response of reproductive processes and resource allocation to seeds, to combination of air pollutants.

Anticipated Results:

- 1) An experimental protocol to examine the effect of various mixtures of gaseous and wet deposited air pollutants on reproductive processes and resource allocation in trees in the field.
- 2) To identify genetic variation in maternal and paternal contribution to air pollution sensitivity that may be useful for breeding resistant genotypes

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Simulated Acid Rain on the Plant Cuticle

PRINCIPAL INVESTIGATOR

NAME: Kevin Percy

PHONE: (506) 452-3581

AGENCY AND DEPARTMENT: Canadian Forestry Service

ADDRESS: Permanent Address:

Maritimes Forest Research Centre
P.O. Box 4000
Fredericton, New Brunswick
CANADA E3B 5P7

Current Address:

Long Ashton Research Station
Long Ashton
Bristol BS18 9DL
England

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. E.A. Baker, Long Ashton Research Station
Dr. P.J. Holloway, Long Ashton Research Station

DURATION: January 9, 1984 - January 9, 1987

APPROXIMATE COST PER YEAR: \$ 8,000

PROJECT OBJECTIVES/DESCRIPTION

Plants of various crop species (5 + 6 mutants) and Sitka spruce (2 clones) selected for their variation in cuticular characteristics will be exposed to realistic amounts of simulated acid rain (7 pH's) in a specially designed calibrated environment - rain tower.

The effects of rain treatment on the following aspects of the cuticle will be investigated:

- 1) Rate and amount of epicuticular wax production
- 2) Epicuticular wax morphology
- 3) Epicuticular wax chemistry
- 4) Cuticular membrane ultrastructure
- 5) Leaf wettability

LRTAP PROJECT DESCRIPTION

TITLE

Simulated Acid Rain Effects on the Plant Cuticle in Relation to Foliar Uptake of Inorganic Ions

PRINCIPAL INVESTIGATOR

NAME: Kevin Percy

PHONE: (506) 452-3581

AGENCY AND DEPARTMENT: Canadian Forestry Service

ADDRESS: Permanent Address:

Maritimes Forest Research Centre
P.O. Box 4000
Fredericton, New Brunswick
CANADA E3B 5P7

Current Address:

Long Ashton Research Station
Long Ashton
Bristol BS18 9DL
England

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. E.A. Baker, Long Ashton Research Station

DURATION: January 9, 1985 - January 9, 1987

APPROXIMATE COST PER YEAR: \$ 5,000

PROJECT OBJECTIVES/DESCRIPTION

Plants of various crop species (3) and Sitka spruce (2 clones) will be exposed in a specially constructed, controlled environment rain tower to simulated rain or several acidities in order to induce various degrees of change in cuticular characteristics.

The plants will then be treated with mono-size droplets of various sizes produced with a specially designed microsprayer. The droplets will contain the radioisotopes ⁸⁶Rb, ³⁵SO₄ and ⁶³Ni.

The following parameters will be studied:

- a) Uptake of the isotopes in relation to changes in the cuticle induced by acid rain
- b) The localization of the isotopes within the epicuticular wax (structural and amorphous), the cuticular membrane, the epidermis, and the underlying leaf tissue

LRTAP PROJECT DESCRIPTIONTITLE

Throughfall and Stemflow Chemistry on a Variety of Forest Stands

PRINCIPAL INVESTIGATOR

NAME: Bill Freedman

PHONE: (902) 424-3829

AGENCY AND DEPARTMENT: Institute for Environmental Studies and Department
and Department of Biology

ADDRESS: Dalhousie University
Halifax, N.S.
B3H 4J1

COOPERATIVE AGENCIES U. Prager, J.G. Ogden
AND INVESTIGATORS
(IF APPLICABLE): Funding: Canadian Forestry Service

DURATION: 1981 - 1984

APPROXIMATE COST PER YEAR: \$10,000

PROJECT OBJECTIVES/DESCRIPTION

Eight field sites in Nova Scotia; four hardwood and four softwood stands of differing species composition; stemflow monitored for eleven tree species (20 stems/species); throughfall for each stand measured with twenty five replicates/stand; measurements made weekly over one growing season; determinations made of concentration and flux of all major chemical constituents.

PROJECT NUMBER
227

SUBJECT CODE
3.2

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Acid Deposition on Forests
Phase 1 - Critical Assessment of the Scientific Literature

PRINCIPAL INVESTIGATOR

NAME: Allen L. Torrenueva

PHONE: (416) 592-6314

AGENCY AND DEPARTMENT: Ontario Hydro
Environmental Studies and Assessment Department

ADDRESS: 700 University Avenue
Toronto, Ontario
M5G 1X6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Canadian Electrical Association

DURATION: 1984-1985; application for funding of Phase 2 submitted to CEA

APPROXIMATE COST PER YEAR: \$ 90,000

PROJECT OBJECTIVES/DESCRIPTION

To critically assess recently reported research on the effects of acid deposition and air quality on forest productivity. Several "key" papers were selected for appraisal. "Key" papers are reviewed, original papers published in technical journals describing the growth responses of trees to claimed acid rain.

SUBJECT CODE

3.3

PROJECT NUMBER

228

LRTAP PROJECT DESCRIPTION

TITLE

Analysis of Existing Ecosystem Chemistry Data Pertinent to the ARNEWS Plot
Established Near Spur 17 in the UBC Research Forest

PRINCIPAL INVESTIGATOR

NAME: M.C. Feller

PHONE: (604) 228-3729

AGENCY AND DEPARTMENT: Faculty of Forestry

ADDRESS: UBC, Vancouver, B.C.

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Canadian Forest Service Contract (Scientific Authority)

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$ 10,000

PROJECT OBJECTIVES/DESCRIPTION

To supply Canadian Forest Service with analyses of long term soil, water and precipitation chemistry gathered adjacent to Acid Rain National Early Warning System (ARNEWS) plot.

PROJECT NUMBER
229

SUBJECT CODE
3.3

LRTAP PROJECT DESCRIPTION

TITLE

Monitoring Soil Changes and Acidic Input Sensitivity of Selected British Columbia Soils

PRINCIPAL INVESTIGATOR

NAME: Dr. John Wiens

PHONE: (604) 387-4321

AGENCY AND DEPARTMENT: Ministry of Environment
Waste Management Branch

ADDRESS: 810 Blanshard Street
Victoria, B.C.
V8V 1X5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Pacific Forest Research Centre; Mr. J. Senyk
Surveys and Resources Mapping Branch; Mr. H.A.
Luttnerding

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$18,000

PROJECT OBJECTIVES/DESCRIPTION

Site selection, soil sampling and laboratory analysis will be carried out in areas of particular concern in southern British Columbia. The objectives will be:

- a) to establish long-term monitoring sites and measure changes if any in acidic input sensitivity related parameters
- b) to establish trends if any and relate these to changes in acidic inputs

Cooperation with the Pacific Forest Research Centre and particularly the Acid Rain National Early Warning System (ARNEWS) is planned where possible.

SUBJECT CODE

3.3

PROJECT NUMBER

230

LRTAP PROJECT DESCRIPTION

TITLE

Biological Monitoring of Ozone Impacts in the Lower Mainland, British Columbia

PRINCIPAL INVESTIGATOR

NAME: Dr. Vic Runeckles

PHONE: (604) 228-3451

AGENCY AND DEPARTMENT: Plant Sciences Department
University of British Columbia

ADDRESS: 2357 Main Mall
Vancouver, B.C.
V6T 1A2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Environmental Protection Service
Environment Cost

DURATION: Summer, 1985

APPROXIMATE COST PER YEAR: \$ 8,000

PROJECT OBJECTIVES/DESCRIPTION

Assess spatial ozone levels by biological monitoring using twelve sites in the Lower Mainland growing on ozone sensitive tobacco strain. Acute and chronic effects due to ozone exposure will be determined by visual inspection of plants.

PROJECT NUMBER
231

SUBJECT CODE
3.3

LRTAP PROJECT DESCRIPTION

TITLE

Research in Support of Biomonitoring: The Responses of Vegetation to Aerial Emissions

PRINCIPAL INVESTIGATOR

NAME: Dr. G. Singleton

PHONE: (403) 427-3943

AGENCY AND DEPARTMENT: Alberta Environment
Research Management Division
14th Floor Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

ADDRESS:

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Dr. George La Roi
Department of Botany
University of Alberta
Edmonton, Alberta
T6G 2E9

DURATION: 1980 - 1985

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

The project investigates the short and long term response of vegetational communities to aerial emissions. It compares the structural dynamics in non-contaminated boreal forest ecosystems to those induced in boreal forests exposed to aerial emissions.

LRTAP PROJECT DESCRIPTION

TITLE

Terrestrial Monitoring for Acidic Deposition in Manitoba

PRINCIPAL INVESTIGATOR

NAME: D.L. Wotton

PHONE: (204) 945-7081

AGENCY AND DEPARTMENT: Terrestrial Standards and Studies
Manitoba Dept. of Environment and Workplace Safety
and Health

ADDRESS: Bldg. 2
139 Tuxedo Ave.
Winnipeg, Manitoba
R3N 0H6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Canadian Forestry Service,
Northern Forest Research Centre,
Edmonton, Alberta.

DURATION: 1985 - ongoing

APPROXIMATE COST PER YEAR: \$10,000 Manitoba

PROJECT OBJECTIVES/DESCRIPTION

In co-operation with the Canadian Forestry Service 5 sites were established throughout the province of Manitoba to provide early warning detection from the long range transport of air pollutants.

The sites are located in areas mapped as having a high sensitivity to acid rain through soil and geology characteristics. Monitoring sites are located in young conifer stands and will be evaluated annually.

This program is an expansion of the Federal ARNEWS program. Monitoring is expected to continue for the next decade.

LRTAP PROJECT DESCRIPTION

TITLE

The Effect of Acid Precipitation on Southern Ontario Soils

PRINCIPAL INVESTIGATOR

NAME: D.E. Dimma
(Dr. S.N. Linzon, Supervisor)

PHONE: (416) 965-4516

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch
Phytotoxicology Section

ADDRESS: 880 Bay Street, Suite 347
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES

AND INVESTIGATORS

(IF APPLICABLE):

Ontario Ministry of Natural Resources
Ontario Ministry of Agriculture and Food

DURATION: Program continuous

APPROXIMATE COST PER YEAR: \$96,000(1985/1986)

PROJECT OBJECTIVES/DESCRIPTION

To establish baseline status for chemical and physical constituents in undisturbed soils in order to monitor future trends.

To develop criteria for soil sensitivity to acidic deposition and to map soils with respect to:

- a) forest productivity
- b) water quality
- c) soil changes

To determine the natural spatial and seasonal variation in soil parameters within a small area at a sampling site.

LRTAP PROJECT DESCRIPTIONTITLE

"Acid Rain" National Early Warning System

PRINCIPAL INVESTIGATOR

NAME: Ed. S Kondo

PHONE: (819) 997-2269

AGENCY AND DEPARTMENT: Canadian Forestry Service
Forests Insect and Disease Survey

ADDRESS: Place Vincent Massey
Ottawa, Ontario
K1A 1G5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

G.A. Van Sickle, Pacific Forest Research Centre
L.P. Magasi, Northern Forest Research Centre
G.M. Howse, Great Lakes Forest Research Centre
D. Lachance, Laurentian Forest Research Centre
B.H. Moody, Maritimes Forest Research Centre
J. Hudak, Newfoundland Forest Research Centre

All investigators above are from the Canadian Forestry Service.

DURATION: commenced in 1984 and is designed for long term (20 years) monitoring

APPROXIMATE COST PER YEAR: \$80,000 with additional extensive sample collection and analysis costs every five years of \$50,000

PROJECT OBJECTIVES/DESCRIPTION

The objectives of the program are:

1. To detect the possible damage to forest trees and soils caused by acid rain or to identify the damages sustained by Canadian forests (trees and which are not attributable to natural causes or management practices).
2. Long term monitoring of vegetation and soils to detect future changes attributable to acid deposition and other air pollutants in representative forest ecosystems.

A network of plots, together with the integration of available information from all sources on acid rain and air pollutants in Canada, has been termed the Acid Rain National Early Warning System (ARNEWS). It was established in 1984.

Over 100 permanent plots are maintained in all regions of Canada to monitor:

1. The condition and changes in the conditions of the forest stand.
2. The presence and fluctuation of biotic and abiotic factors that affect the condition of the forest (insects, diseases, stand changes, temperature, etc.).
3. The changes and symptoms that indicate factors not attributable the above that could conceivably be early signs of acid rain damage.
4. Effects of acid rain on the condition of the various economically important tree species.

LRTAP PROJECT DESCRIPTIONTITLE

Epiphyte Monitoring Programme, District of Thunder Bay

PRINCIPAL INVESTIGATOR

NAME: Dr. H. Dennis Griffin

PHONE: (807) 475-1215

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Northwestern Region

ADDRESS: P.O. Box 5000
Thunder Bay, Ontario
P7C 5G6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Contractor:
Dr. Paul Barclay
Biology Department
Lakehead University
Thunder Bay, Ontario
P7B 5E1

Cooperating Agency:
Phytotoxicology Section
Air Resources Branch
Ontario Ministry of the
Environment
(Dr. S.N. Linzon)

DURATION: 3 Years

APPROXIMATE COST PER YEAR: \$5000

PROJECT OBJECTIVES/DESCRIPTION

Determine concentrations of selected chemical constituents of lichens and mosses sampled in 1970-71 in the District of Thunder Bay and compare with data from repeat sampling from the same sites in 1981-83.

Lichens and mosses were collected from approximately 36 sites originally sampled in 1970-71. Both old and new sets of sample material will be submitted for chemical analysis.

This study should reveal changes, if any, which have occurred over a period of approximately 10 years in some chemical constituents of commonly-occurring lichens and mosses.

SUBJECT CODE
3.3

PROJECT NUMBER
236

LRTAP PROJECT DESCRIPTION

TITLE

Trace Metal Deposition to Lichens and Mosses in New Brunswick

PRINCIPAL INVESTIGATOR

NAME: Jane Tims

PHONE: (506) 453-2669

AGENCY AND DEPARTMENT: Environmental Services Branch
Environment New Brunswick

ADDRESS: P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1984-1985, repeat sampling in 1990

APPROXIMATE COST PER YEAR: \$ 10,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the levels of trace metals deposition to two species of lichen and two species of sphagnum moss in ombrotrophic bogs through out New Brunswick.

Species lists and tissue analysis have been completed for 14 bogs.

Moss bag survey (2, one month exposures) conducted in July and August, 1985.

Study to be repeated after 5 year interval to document change.

PROJECT NUMBER
237

SUBJECT CODE
3.3

LRTAP PROJECT DESCRIPTION

TITLE

Biological Monitoring of Atmospheric Deposition

PRINCIPAL INVESTIGATOR

NAME: K.J. Puckett

PHONE: (416) 667-4797

AGENCY AND DEPARTMENT: Atmospheric Environment Service

ADDRESS: 4905 Dufferin Street
Downsview, Ontario
M3H 5T4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$30,000 - \$50,000

PROJECT OBJECTIVES/DESCRIPTION

Spatial/temporal variations in plant element concentration has been demonstrated in eastern Canada. The intent is to quantify the relationship between element/compound deposition and biomonitor element concentrations. Plant element levels are compared with measured and calculated depositions of, for example, lead and sulphur.

The relative contribution of wet and dry deposition to plant element contributions are experimentally assessed and temporal changes in lichen element concentrations are compared against known temporal changes in element availability. A quantitative linkage between deposition and plant element accumulation will be developed.

SUBJECT CODE
3.3

PROJECT NUMBER
238

LRTAP PROJECT DESCRIPTION

TITLE

Long-Range Transport of Metals by Atmospheric Processes

PRINCIPAL INVESTIGATOR

NAME: W.A. Glooschenko

PHONE: (416) 637-4229

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: April, 1985 - March 1986

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

Coal-fired power plants and mining activities are major sources of atmospheric emissions of metals, S, As, and Se to adjacent aquatic ecosystems. This study will develop biotic monitors of atmospheric deposition to supplement direct precipitation sampling in remote areas.

Goals:

1. To conduct a baseline study of trace metals, As, Se and S in Sphagnum mosses, lichens, peat, and plant litter in areas of intensive mining activity and near coal-fired plants.
2. To determine scientifically-valid, cost-effective biotic monitors of atmospheric metal deposition and organochlorine contaminants.
3. To determine baseline concentrations of metals in mosses and lichens in areas remote from point sources.

PROJECT NUMBER
239

SUBJECT CODE
3.4

LRTAP PROJECT DESCRIPTION

TITLE

Damage Vulnerability Index

PRINCIPAL INVESTIGATOR

NAME: Alan G. Teskey

PHONE: (416) 997-1683

AGENCY AND DEPARTMENT: Canadian Forestry Service

ADDRESS: Place Vincent Massey

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

G. Alex Fraser
Canadian Forestry Service

DURATION: Completed 1986

APPROXIMATE COST PER YEAR: Total Cost: \$ 25,000

PROJECT OBJECTIVES/DESCRIPTION

The objective of this project is to geographically delineate the vulnerability of the forest industry to net sulphate and nitrate deposition. Information on deposition levels, soil buffering capability and species sensitivity are being integrated into a vulnerability index. A series of vulnerability classes will then be mapped using the information base of the Canadian Forestry Inventory. This forest resource information will then be integrated with census information on forest industry location and socio-economic characteristics. This will shed light on the potential regional impacts of LRTAP damage on a sub-provincial basis.

SUBJECT CODE
3.4

PROJECT NUMBER
240

LRTAP PROJECT DESCRIPTION

TITLE

The Forestry Benefits of Long Range Air Pollution Control

PRINCIPAL INVESTIGATOR

NAME : G. Alex Fraser

PHONE : (416) 997-1683

AGENCY AND DEPARTMENT : Canadian Forestry Service

ADDRESS : Place Vincent Massey

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

N/A

DURATION : Phase I : Completed 1985
Phase II: Undetermined

APPROXIMATE COST PER YEAR : Phase I: \$20,000
Phase II: Undetermined

PROJECT OBJECTIVES/DESCRIPTION

Phase I: The intent of phase I is to obtain a preliminary estimate of the social and economic benefits (in the area of commercial forestry) to be derived from the control of long range air pollution. Step one involves using the results of the CFS expert opinion survey to delineate the nature and potential range of forest productivity impacts with and without pollution control. Step 2 involves determining the implications of forest productivity changes for future harvest levels with and without pollution control. Step 3 involves estimating the social and economic value of the difference in harvest rates with and without pollution control.

Phase II: The preliminary estimate in phase I incorporates numerous simplifying assumptions regarding economic variables. Phase II would incorporate more rigorous modelling of forest product markets in order to determine impacts on forest product prices and the distribution of benefits between producers and consumers. Other elements of phase II would include an assessment of the non-pecuniary forestry benefits of long range air pollution control (such as recreational and aesthetic benefits). Also, benefits to be derived from annual tree cropping activities, such as maple sugar production, could be assessed.

PROJECT NUMBER
241

SUBJECT CODE
3.4

LRTAP PROJECT DESCRIPTION

TITLE

The Potential Impact of the Long Range Transport of Air Pollutants on Canadian Forests

PRINCIPAL INVESTIGATOR

NAME: G. Alex Fraser

PHONE: (416) 997-1683

AGENCY AND DEPARTMENT: Canadian Forestry Service

ADDRESS: Place Vincent Massey

COOPERATIVE AGENCIES University of Alberta: Dr. W.E. Phillips
AND INVESTIGATORS
(IF APPLICABLE): A.G. Teskey and Gary D. Hogan

DURATION: Completed 1985

APPROXIMATE COST PER YEAR: Total Cost: \$100,000

PROJECT OBJECTIVES/DESCRIPTION

The intent of the project was to solicit and aggregate informed scientific opinion on the potential adverse impacts of LRTAP on Canadian forests. This was done using an iterative series of 4 questionnaires interspersed with summarised feedback and opinions from previous responses. Opinions were solicited on the nature, extent and likelihood of alternative forest productivity effects both at present and into the future. Opinions on future effects were solicited under the assumption of several different pollution levels.

SECTION 4

AQUATIC/TERRESTRIAL LINKAGES

LRTAP PROJECT DESCRIPTION

TITLE

Yukon Soils and Geology Sensitivity Mapping

PRINCIPAL INVESTIGATOR

NAME: John P. Senyk

PHONE: (604) 388-0688

AGENCY AND DEPARTMENT: Pacific Forestry Centre
Canadian Forestry Service

ADDRESS: Canadian Forestry Service
506 West Burnside Road
Victoria, B.C.
V8Z 1M5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

B.C. Ministry Environment - J. Weins
Alberta Environment - N. Holowaychuk
Saskatchewan Environment - Glen Padbury
Manitoba Environment - Dave Wotton
Lands Directorate - C. Rubec

DURATION: 3 years (.6 P/Y) total

APPROXIMATE COST PER YEAR: \$ 2,000

PROJECT OBJECTIVES/DESCRIPTION

Produce maps of:

- 1) Potential of soil and geology to reduce the acidity of incoming acidic deposition (impacting aquatic resource).
- 2) Soil sensitivity to acidic deposition (impacting vegetation).

PROJECT NUMBER
243

SUBJECT CODE
4.1

LRTAP PROJECT DESCRIPTION

TITLE

Soil and Bedrock Sensitivity to Acidic Deposition in the N.W.T.

PRINCIPAL INVESTIGATOR Emery Paquin, Pollution Control Division
Government of the N.W.T.

NAME: Anne Lucas - Contractor

PHONE: (403) 873-7654

AGENCY AND DEPARTMENT: Pollution Control Division
Department of Renewable Resources
Government of the N.W.T.

ADDRESS: P.O. Box 1320
(6th Floor, Courthouse Building)
Yellowknife, N.W.T. X1A 2L9

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Anne Lucas - Contractor
Lands Directorate

DURATION:

APPROXIMATE COST PER YEAR: \$ 24,000

PROJECT OBJECTIVES/DESCRIPTION

To develop sensitivity maps for the N.W.T.

LRTAP PROJECT DESCRIPTION

TITLE

Evaluation of Correspondence Between Soil and Geology Sensitivity Maps and Lake Sensitivity Maps

PRINCIPAL INVESTIGATOR

NAME: Dr. John H. Wiens

PHONE: (604) 387-4321
(339)

AGENCY AND DEPARTMENT: Ministry of Environment
Waste Management Branch

ADDRESS: 810 Blanshard Street
Victoria, B.C.
V8V 1X5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Water Management Branch, Ministry of Environment
Mr. Les Swain

DURATION: 1 year

APPROXIMATE COST PER YEAR: \$ 6,500

PROJECT OBJECTIVES/DESCRIPTION

A systematic comparison of lake sensitivity maps and soil and geology sensitivity maps prepared for British Columbia. Objectives would be:

- a) to allow a test of the ratings of soil and geology to reduce acidity of incoming acidic deposition
- b) to allow identification of anomalies between soil and geology and lake sensitivity ratings.

It is proposed that several approaches be investigated to undertake the comparison, including developing 2-way classes of terrestrial and aquatic sensitivity, and making map delineations based on watershed boundaries.

PROJECT NUMBER
245

SUBJECT CODE
4.1

LRTAP PROJECT DESCRIPTION

TITLE

Ongoing Evaluation of Soil Sensitivity Related Chemical Properties and Sensitivity Rating Criteria

PRINCIPAL INVESTIGATOR

NAME: Dr. John Wiens

PHONE: (604) 387-4321
(339)

AGENCY AND DEPARTMENT: Ministry of Environment
Waste Management Branch

ADDRESS: 810 Blanshard Street
Victoria, B.C.
V8V 1X5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Ministry of Agriculture and Food
Soil and Tissue Testing Laboratory
Dr. Bill Van Lierop

DURATION: 1 year

APPROXIMATE COST PER YEAR: \$ 8,500

PROJECT OBJECTIVES/DESCRIPTION

Sensitivity rating criteria have been based on limited information about soil property and vegetation responses to acidic inputs. The objectives of this project will be:

- a) to conduct limited selected investigations of soil properties believed important to sensitivity interpretations (e.g. SO₄ adsorption; Al solubilization) using several B.C. soils
- b) assess these characteristics for alternate or refined rating criteria.

SUBJECT CODE
4.1

PROJECT NUMBER
246

LRTAP PROJECT DESCRIPTION

TITLE

Sensitivity Assessment of Alberta Lakes to Acid Deposition

PRINCIPAL INVESTIGATOR

NAME: Dr. B. Hammond

PHONE: (403) 427-6254

AGENCY AND DEPARTMENT: Research Management Division

ADDRESS: 14th Floor, Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Water Quality Branch, PCD
D. Trew and P. Mitchell

DURATION: 2 years (1982 -1984); project complete

APPROXIMATE COST PER YEAR: \$15,000 (Total \$30,000)

PROJECT OBJECTIVES/DESCRIPTION

This project was initiated (1982) as a commitment by Alberta Environment to Western LRTAP and was conducted in close association with the Water Quality Branch, PCD. Phase I of this project involved establishing the criteria for sensitivity of surface waters in Alberta to deposition of acid forming emissions and the production of the initial set of aquatic sensitivity maps. These maps were prepared from an examination of all available sources of water quality data produced in Alberta. Phase II of this project (1983/84) involved updating the preliminary maps with current monitoring data to address the gaps identified in Phase I. The maps and final report will soon be available.

PROJECT NUMBER
247

SUBJECT CODE
4.1

LRTAP PROJECT DESCRIPTION

TITLE

Lake Sensitivity to Acid Deposition Mapping in Saskatchewan

PRINCIPAL INVESTIGATOR

NAME: Mr. Larry Lechner

PHONE: (306) 787-6195

AGENCY AND DEPARTMENT: Saskatchewan Environment

ADDRESS: 3085 Albert Street
Regina, Saskatchewan
S4S 0B1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Environment Canada

DURATION: Began in 1983

APPROXIMATE COST PER YEAR: \$10,000 (85-86)

PROJECT OBJECTIVES/DESCRIPTION

- To map a representative sample of lakes in Saskatchewan on the basis of their sensitivity to acidification.
- Initial contour maps produced by Environment Canada's computer program called "General Purpose Contouring Program".
- Maps of pH, alkalinity and calcium content are being produced.

LRTAP PROJECT DESCRIPTION

TITLE

Soil and Geology Sensitivity Mapping for Acidic Deposition in Manitoba

PRINCIPAL INVESTIGATOR

NAME: D. Wotton

PHONE: (204) 945-7081

AGENCY AND DEPARTMENT: Terrestrial Standards and Studies
Manitoba Department
Environment and Workplace Safety
and Health

ADDRESS: Bld 2, 139 Tuxedo Avenue,
Winnipeg, Manitoba

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Canada/Manitoba Soil Survey
University of Manitoba
Winnipeg, Manitoba

DURATION: 1981 - 1985

APPROXIMATE COST PER YEAR: \$ 3,000

PROJECT OBJECTIVES/DESCRIPTION

To map the sensitivity of soils and geological characteristics of the Manitoba landscape to acidic deposition or the long range transport of air pollutants. Sensitivity was defined as an expression of the respective susceptibilities of different soils to changes of one or more of the following: pH, mobilization of exchangeable bases and solubilization of aluminum in response to a given input of acidity.

The mapping was co-operatively developed with other jurisdictions of Western Canada to ensure a compatible uniform product. Two maps were produced to provide sensitivity interpretation for both terrestrial and aquatic ecosystems.

PROJECT NUMBER
249

SUBJECT CODE
4.1

LRTAP PROJECT DESCRIPTION

TITLE

Aquatic Sensitivity To Acid Deposition Mapping Manitoba

PRINCIPAL INVESTIGATOR

NAME: Mr. Dennis J. Brown

PHONE: (204) 945-7033

AGENCY AND DEPARTMENT: Manitoba Department of Environment and Workplace
Safety and Health
Environmental Management Services Branch

ADDRESS: Box 7, Building 2
139 Tuxedo Avenue
Winnipeg, Manitoba
R3N 0H6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE) Environment Canada
Water Quality Branch
Western and Northern Region
Mr. Dennis J. Gregor

DURATION: Began in 1983 - Ongoing

APPROXIMATE COST (PER YEAR): \$ 8,000 (1985 - 1986)

PROJECT OBJECTIVES/DESCRIPTION

- To map aquatic sensitivity to acid deposition for Manitoba.
- The initial contour maps are being produced by Environment Canada.
- The map will be fit to adjacent provincial maps upon completion.
- To update the map as additional data becomes available.

SUBJECT CODE

4.1

PROJECT NUMBER

250

LRTAP PROJECT DESCRIPTION

TITLE

Northern Manitoba Aquatic Monitoring

PRINCIPAL INVESTIGATOR

NAME: Mr. Dennis J. Brown

PHONE: (204) 945-7033

AGENCY AND DEPARTMENT: Manitoba Department of Environment and Workplace
Safety and Health
Environmental Management Services Branch

ADDRESS: Box 7, Building 2
139 Tuxedo Avenue
Winnipeg, Manitoba
R3N 0H6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Geological Survey of Canada
Manitoba Department of Energy and Mines

DURATION: 1983 - 1988

APPROXIMATE COST (PER YEAR): \$26,000 (analytical costs; 1985 -1986)

PROJECT OBJECTIVES/DESCRIPTION

The sample collection is being done with the cooperation of the Geological Survey of Canada Department of Energy and Mines under the Canada/Manitoba Mineral Agreement.

To obtain aquatic chemical data applicable to LRTAP sensitivity from Northern Manitoba.

PROJECT NUMBER
251

SUBJECT CODE
4.1

LRTAP PROJECT DESCRIPTION

TITLE

Lake Sampling Program, Northwestern Ontario

PRINCIPAL INVESTIGATOR

NAME: L.W. Maki

PHONE: (807) 475-1215

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Northwestern Region

ADDRESS: 435 James Street South
Thunder Bay, Ontario
P7C 5G6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Mr. J. Sutton
Dr. K.J. Deacon
Dr. G.W. Ozburn
Lakehead University (Contractor)

PHONE: (807) 345-2121

DURATION: Yearly

APPROXIMATE COST PER YEAR: \$162,000

PROJECT OBJECTIVES/DESCRIPTION

- To compile water chemistry data on Northwestern Ontario lakes generated by A.P.I.O.S. funding from 1979-1982.
- to investigate possible water chemistry/bedrock and soil type relationships, as well as any temporal and geographical trends.
- to continue monitoring two sets of sensitive lakes receiving different atmospheric acidic loadings.

Composite water column sampling by float-equipped plane and helicopter, three to five times a year.

A final report was submitted in April 1983, including a sensitivity listing of approximately 450 lakes across Northwestern Ontario. The listing will be updated with data for 1983 and 1984 and is expected in final form by December 1985.

SUBJECT CODE

4.1

PROJECT NUMBER

252

LRTAP PROJECT DESCRIPTION

TITLE

Lake Sensitivity Surveys, Northeastern Ontario

PRINCIPAL INVESTIGATOR

NAME: W. Keller

PHONE: (705) 675-4501

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Northeastern Region

ADDRESS: 199 Larch Street
Sudbury, Ontario
P3E 5P9

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Annual

APPROXIMATE COST PER YEAR: approx. \$20,000

PROJECT OBJECTIVES/DESCRIPTION

To document the spatial extent of lake sensitivity in Northeastern Ontario.

Approximately 100 new lakes are sampled per year for pH, inflection point alkalinity and conductivity.

All data are incorporated into the provincial lake sensitivity database on an annual basis.

PROJECT NUMBER
253

SUBJECT CODE
4.1

LRTAP PROJECT DESCRIPTION

TITLE

Southwestern Quebec Watershed Geochemistry Soil Survey

PRINCIPAL INVESTIGATOR

NAME: D. Gamache
R.G. Hélie

PHONE: (418) 694-7261

AGENCY AND DEPARTMENT: Lands Directorate
Quebec Region

ADDRESS: Environment Canada
C.P. 10100
Ste-Foy, Quebec G1V 4C7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Inland Waters Directorate
Environment Canada Quebec Region

DURATION: Project Initiated in 1983, expected completion March 1986

APPROXIMATE COST PER YEAR: 1985-1986 1.5 (P/Y), \$75,000

PROJECT OBJECTIVES/DESCRIPTION

To provide descriptive and laboratory field survey data on soils, terrain, vegetation, relief and geochemistry in 35 Inland Water Directorate monitoring watersheds in Southwestern Quebec.

To provide statistical analyses interlinking and identifying key terrestrial factors influencing measured changes in aquatic chemistry of headwater lakes.

SUBJECT CODE

4.1

PROJECT NUMBER

254

LRTAP PROJECT DESCRIPTION

TITLE

An Evaluation of the Potential Acid Precipitation Sensitivity of the Ecodistricts of Quebec

PRINCIPAL INVESTIGATOR

NAME: L.K. Li (Contractor)

PHONE: (819) 997-2320

AGENCY AND DEPARTMENT: Lands Directorate
Environment Canada

ADDRESS: Ottawa, Ontario
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Project initiated in 1984-85

APPROXIMATE COST PER YEAR: 1985-86 0.1 (P/Y), \$5,000

PROJECT OBJECTIVES/DESCRIPTION

Provides a complete assessment of the potential of soils and bedrock materials for all the area of Quebec to reduce acidity of incoming acid precipitation.

Publishing of a 1:2 500 000 color map and descriptive text in the Ecological Land Classification Report Series by November 1985.

PROJECT NUMBER
255

SUBJECT CODE
4.1

LRTAP PROJECT DESCRIPTION

TITLE

Overview of Land Resources at Risk in Sulphate Loading Zones in Eastern Canada

PRINCIPAL INVESTIGATOR

NAME: P. Lynch, L. Li

PHONE: (819) 997-2320

AGENCY AND DEPARTMENT: Lands Directorate
Environment Canada
Ottawa, Ontario

ADDRESS:

COOPERATIVE AGENCIES Land Use Division
AND INVESTIGATORS Lands Directorate
(IF APPLICABLE):

DURATION: Project Initiated March 1985

APPROXIMATE COST PER YEAR: 1985-86 0.9 (P/Y) \$8,000

PROJECT OBJECTIVES/DESCRIPTION

To prepare an initial statistical summary report of the distribution of prime agriculture, forest and reaction lands within heavily LRTAP impacted watersheds of eastern Canada to detail nature of lands at risk.

To utilize interactive computer graphics and a micro data base to intercorrelate and report upon the nature of land values, economy and land utilization of lands in highly sensitive, highly impacted zones of eastern Canada.

LRTAP PROJECT DESCRIPTIONTITLE

National Overview of Generalized Aquatic Ecosystem Sensitivity to LRTAP

PRINCIPAL INVESTIGATOR

NAME: C. Rubec, R. Sayer

PHONE: (819) 997-2320

AGENCY AND DEPARTMENT: Lands Directorate

ADDRESS: Environment Canada
Ottawa, Ontario
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Western LRTAP Technical Committee
Department of Environment B.C., Alta., Sask., Man.
Department Renewable Resources, GNWT
CFS, Victoria

DURATION: Initiated December 1984

APPROXIMATE COST PER YEAR: 1985-86 0.3 (P/Y), \$10,000

PROJECT OBJECTIVES/DESCRIPTION

To prepare an ECS fact sheet and small scale map by September 1985.

To produce a nationally standardized and correlated 1:7 500 000 map of Canada and report outlining the development of a national sensitivity model and sensitivity mapping base for aquatic ecosystem response to changes in the soil/bedrock system affected by acid precipitation (by April 1986). Map proposed for publication in color in the National Atlas of Canada.

PROJECT NUMBER
257

SUBJECT CODE
4.1

LRTAP PROJECT DESCRIPTION

TITLE

Wetland LRTAP Sensitivity and Ecosystem Interactions

PRINCIPAL INVESTIGATOR

NAME: J. Anderson (Contractor)

PHONE: (819) 997-2320

AGENCY AND DEPARTMENT: Lands Directorate
Environment Canada

ADDRESS: Lands Directorate
Environment Canada
Ottawa, Ontario
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Inland Waters Directorate and
Canadian Wildlife Service

DURATION: Contract completed May 1985. Follow on studies slated to begin
January 1986

APPROXIMATE COST PER YEAR: 1985-86 0.2 (P/Y), \$6,000

PROJECT OBJECTIVES/DESCRIPTION

- (1) A project report for publication (a) reviews current and past research into acid precipitation interactions with wetland ecosystems, (b) develops preliminary wetland sensitivity criteria, (c) details existing and planned research relating LRTAP-Wetlands, (d) summarizes recommendations of a NATO Workshop in May 1985 centring of wetland LRTAP research needs.
- (2) To develop an integrated land-aquatic-wildlife research project in 1985-86 examining LRTAP-Wetland effects.

LRTAP PROJECT DESCRIPTIONTITLE

Effects of Forest Management Practices on Forest-Watershed Ecosystem
Biogeochemistry

PRINCIPAL INVESTIGATOR

NAME: M.C. Feller

PHONE: (604) 228-3729

AGENCY AND DEPARTMENT: Faculty of Forestry
University of British Columbia

ADDRESS: Faculty of Forestry
University of British Columbia
Vancouver, British Columbia
V6T 1W5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1970 - Indefinite

APPROXIMATE COST PER YEAR: \$20,000

PROJECT OBJECTIVES/DESCRIPTION

The objectives of the project are to quantify the effects of clearcutting, slashburning, and herbicide treatments on forested watershed nutrient (N, P, K, Na, Mg, Ca, and S) budgets and to study some of the processes thought to control streamwater chemistry in the area of study-southwestern British Columbia.

Precipitation, soil solution, and streamwater samples are collected regularly and analyzed for pH, electrical conductivity, cations and anions. Five different watersheds have been instrumented. One was clearcut and slashburned in 1974/75 another was clearcut in 1974, then herbicided in 1982. It will be herbicided again in 1986 then burned. Another was clearcut and slashburned in 1982/83. Two other watersheds are undisturbed, one of which has acted as a control since 1970.

Streambed sediment chemistry has been monitored regularly and the influence of this sediment and large organic debris on streamwater NO₃ transformations has been assessed in field experiments.

LRTAP PROJECT DESCRIPTION

TITLE

Western Region Acid Rain Research Program

PRINCIPAL INVESTIGATOR

NAME: Dr. D.W. Schindler
Dr. J.F. Klaverkamp

PHONE: (204) 949-5212
(204) 949-5003

AGENCY AND DEPARTMENT: Fisheries and Oceans

ADDRESS: Freshwater Institute
501 University Crescent
Winnipeg, MB R3T 2N6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DOE-AES
Lamont-Doherty Geological Observatory, NY
Dr. R. Anderson, S. Schiff
University of Winnipeg - Dr. C. Kelly
University of Minnesota - Dr. E. Gorham
University of Alberta - Dr. D. Vitt

DURATION: 1985 - 1990

APPROXIMATE COST PER YEAR: \$740,000 (\$480,000 + \$260,000 "A" Base)

PROJECT OBJECTIVES/DESCRIPTION

Objectives of the monitoring program are:

1. To extend intensive monitoring data sets which are already the longest in Canada, and the only set in a low deposition, acid-sensitive area.
2. To serve as a "low deposition" monitoring site as a control for monitoring programs in areas of more acidic precipitation.
3. To resample a large set of takes which have been sampled four times since 1967 in order to see whether recent increases in acidity of precipitation are causing lossess of alkalinity.
4. To examine the roles of lake size, basin order and natural temporal cycles in natural variability.
5. To determine ecosystem-level and toxicological indicators of LRTAP stress which will be of widespread utility in monitoring programs.
6. To extend the baseline data base to acid-sensitive areas of the Northwest Territories.

- 2 -

The cause and effect experiments also have several general objectives:

1. To test the efficiency of ecosystem recover once acidic inputs are reduced.
2. To test the need for controlling emissions of LRTAP pollutants other than sulfuric acid, e.g. nitric acid, ammonium sulfate aerosols and trace metals.
3. To provide "real time" calibration for the sensitivity of paleoecological, toxicological and other monitoring techniques.
4. To test the degree of rapidity of responses of upland, wetland and lacustrine parts of acid-sensitive catchments to changes in the acidity of rainfall.

Specific experiments in which the cause and effect studies will be carried out are:

1. Continued reduced sulfuric acid loading of Lake 223.
2. Continued acidification of the two basins of Lake 302 with nitric and sulfuric acids.
3. Continued experimental acidification of bog watershed.
4. Continued background data on lakes for future experiments such as ammonium salt addition.
5. Continued pulsed acidification of Lake 114.

Laboratory studies exploring the use of biochemical sublethal stress indicator is in progress.

PROJECT NUMBER
260

SUBJECT CODE
4.2

LRTAP PROJECT DESCRIPTION

TITLE

Hydrogeochemical Responses of Turkey Lakes to Acid Rain

PRINCIPAL INVESTIGATOR

NAME: R.G. Semkin

PHONE: (416) 637-4397

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1980 - 1988

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

- To quantify the hydrogeochemical response of the Turkey Lakes Watershed (TLW) to acidic precipitation using a mass balance approach. The study will focus on determining the "dose-response" relationship for the basin and the geochemical mechanisms controlling the relationship.
- To determine the mechanisms which control the response of aquatic ecosystems to LRTAP.

SUBJECT CODE
4.2

PROJECT NUMBER
261

LRTAP PROJECT DESCRIPTION

TITLE

Turkey Lakes Calibrated Watershed Study

PRINCIPAL INVESTIGATOR

NAME: J.R.M. Kelso

PHONE: (705) 942-2848

AGENCY AND DEPARTMENT: Fisheries and Oceans
Great Lakes Fisheries Research Branch

ADDRESS: 1219 Queen Street East
Sault Ste. Marie, Ontario
P6A 5M7

COOPERATIVE AGENCIES Environmental Canada
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$142,000

PROJECT OBJECTIVES/DESCRIPTION

To assess the processes and effects of LRTAP (mineral acids and other contaminants) on the biota of a sensitive watershed receiving "moderate" deposition - 30 kg SO₄/ha/yr.

To use the calibrated watershed as a yardstick by which the effects of emission controls, or lack of them, are monitored through time.

Description:

Operate jointly the base data collection of biological material for trend-through-time analysis.

Explore the feasibility of acidifying a catchment or diversion from the main watershed.

Introduce brook trout into head water lake.

Collect post-stocking data in both basins of the head water lake.

PROJECT NUMBER
262

SUBJECT CODE
4.2

LRTAP PROJECT DESCRIPTION

TITLE

Sulfur, Its Forms and Isotopic Composition in Acid Sensitive Lakes

PRINCIPAL INVESTIGATOR

NAME: J.O. Nriagu

PHONE: (416) 637-4223

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985

APPROXIMATE COST PER YEAR: \$37,000

PROJECT OBJECTIVES/DESCRIPTION

Complete the isotopic and mass balance for sulfur in a calibrated watershed by monitoring the flux of sulfur into and out of the various components of the Turkey Lakes basin.

Measure the concentrations of volatile organosulfur compounds in some selected lakes and evaluate their role in the flux of sulfur from these lakes to atmosphere.

LRTAP PROJECT DESCRIPTION

TITLE

Acid Neutralization in Ground Water Flow Systems - Turkey Lakes

PRINCIPAL INVESTIGATOR

NAME: D. Craig

PHONE: (705) 949-9461

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: P.O. Box 490
Sault Ste. Marie, Ontario
P6A 5M7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1980 - 1987

APPROXIMATE COST PER YEAR: \$78,000

PROJECT OBJECTIVES/DESCRIPTION

1. To determine the role of ground water in modifying the effects of acid rain on the hydrologic cycle by determining the ground water component of runoff at selected stream gauging stations in the TLW.
2. To determine the effects of acid precipitation on ground water chemistry and identify acid neutralization reactions operative in the ground water flow systems of the watershed.
3. To determine the acid precipitation capacity of the surficial deposits in the Turkey Lakes Watershed.
4. To define the physical hydrogeologic characteristics of flow system within which the hydrogeochemical evolution of the ground water can be identified.

PROJECT NUMBER
264

SUBJECT CODE
4.2

LRTAP PROJECT DESCRIPTION

TITLE

Biogeochemical Study at High Falls, Northern Ontario

PRINCIPAL INVESTIGATOR

NAME: Dr. W.D. McIlveen

PHONE: (705) 675-4501

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Northeastern Region

ADDRESS: 199 Larch Street
Sudbary, Ontario
P3E 5P9

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Northern Terrestrial Consultants
Suite 7, 1780 Regent Street South
Sudbury, Ontario

DURATION: Continuous since August 1982

APPROXIMATE COST PER YEAR: \$ 200,000

PROJECT OBJECTIVES/DESCRIPTION

To document environmental processes within a forested ecosystem subjected to acidic deposition. The documentation includes elucidation of growth, productivity and turnover processes in a mixed hardwood forest. Atmospheric inputs (wet and dry) and outputs are monitored. Elemental storage within various components of the ecosystem is monitored. The influence of several tree species canopies (white pine, white spruce, jack pine, white birch and trembling aspen) on rainfall chemistry measured as throughfall, stemflow, shrub throughfall and soil percolate is being assessed. Inventories of biological and non-biological materials on the site are being developed. Modelling of the processes will be performed in conjunction with similar studies conducted by the Ministry of the Environment at other locations in Ontario.

SUBJECT CODE

4.2

PROJECT NUMBER

265

LRTAP PROJECT DESCRIPTION**TITLE**

Mesoscale Watershed Study
(Little Rapid, Mahzenazing, Sequin, Shawanaga)

PRINCIPAL INVESTIGATOR

NAME: J.R.M. Kelso
M.G. Johnson

PHONE: (705)942-2848
(519)371-0040

AGENCY AND DEPARTMENT: Fisheries and Oceans
Great Lakes Fisheries Research Branch

ADDRESS: 1180 20th St., E.
P.O. Box 969
Owen Sound, Ontario
N4K 6H6

**COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):**

Ontario Ministry of the Environment
Ontario Ministry of Natural Resources

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$ 99,000

PROJECT OBJECTIVES/DESCRIPTION

To determine how effects from LRTAP are mediated through watershed characteristics of flow, watershed area, lake order, bedrock, overburden, bog, etc; to determine at least in part how watershed features are reflected in fish community structure and body burdens of at least selected metals in fish; to provide a means of predicting fish yield and/or biomass and/or production; and to provide a sound data base upon which change through time can be monitored.

Description:

85/86 will be used to: continue analysis of morphometry/chemistry data; complete mark-recapture fish population studies; continue biological measures of productivity (O/S); examine with Ontario Ministry of Natural Resources means of predicting fish yield/biomass/production; and develop, as appropriate, the basis of monitoring with the Department of Environment.

LRTAP PROJECT DESCRIPTION

TITLE

Watershed Mass Balances

PRINCIPAL INVESTIGATOR

NAME: Dr. P.J. Dillon

PHONE: (705) 766-2412

AGENCY AND DEPARTMENT: Ontario Ministry of Environment
Water Resources Branch
Aquatic Ecosystems Section

ADDRESS: Dorset Research Centre
P.O. Box 39, Bellwood Acres Road
Dorset, Ontario
POA 1E0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing; reports prepared as data warrant

APPROXIMATE COST PER YEAR: \$280,000

PROJECT OBJECTIVES/DESCRIPTION

To develop and test models relating the output of substances (major ions, nutrients, metals, acidity, alkalinity) from different watersheds to geology, land use and hydrology.

Approximately 30 individual watersheds (10km²) have been instrumented for continuous hydrologic measurements since 1976. Atmospheric deposition, and stream chemistry are monitored, geology and soil characteristics are under study, and net and gross watershed budgets calculated.

A preliminary model relating the inputs of acid and acidifying substances to output of the products of weathering reactions as a function of geology will be completed in 1983.

SUBJECT CODE

4.2

PROJECT NUMBER

267

LRTAP PROJECT DESCRIPTION

TITLE

Lake Mass Balances

PRINCIPAL INVESTIGATOR

NAME: Dr. P.J. Dillon

PHONE: (705) 766-2412

AGENCY AND DEPARTMENT: Ontario Ministry of Environment
Water Resources Branch
Aquatic Ecosystem Section

ADDRESS: Dorset Research Centre
P.O. Box 39, Bellwood Acres Road
Dorset, Ontario
POA 1K 0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing; reports prepared as data warrant

APPROXIMATE COST PER YEAR: \$220,000

PROJECT OBJECTIVES/DESCRIPTION

To develop and test models relating hydrology, morphometry, physical factors and input and output of major ions, nutrients, metals, acidity and alkalinity to the lake chemistry.

The major inputs (atmospheric deposition streamflow) to and outflow from eight lakes have been increased since 1976 with hydrology and precipitation measured continuously. Models developed for these lakes will be tested on seven additional lakes for which lake and stream chemistry only have been measured.

Preliminary models are currently in preparation. If successful, they will allow us to predict the effects of current inputs of the substances measured on lake chemistry.

LRTAP PROJECT DESCRIPTION

TITLE

Ion Balance of Lac Laflamme, Montmorency Forest, Quebec

PRINCIPAL INVESTIGATOR

NAME: Madeleine Papineau

PHONE: (418) 648-3921

AGENCY AND DEPARTMENT: Inland Waters Directorate, Quebec Region
Environmental Conservation Service
Environment Canada

ADDRESS: 1141, Route de l'Eglise - 8th floor
Ste-Foy, Quebec
G1V 4H5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Environment Canada (Longueuil)
Water Surveys (Robert Bibeau)
Water Quality Laboratory (Dominique Duval)

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$ 39,400 (0.9 PY)

PROJECT OBJECTIVES/DESCRIPTION

To quantify the effect of LRTAP by:

- a physical-chemical characterization of the lake
- establishing the inputs and outputs of major ions for the basin

Methods:

- Continuous recording at Lac Laflamme of flow at outlet and lake level
- Weekly sampling of water quality of lake and its outlet
- Compilation and interpretation of collected data
- Estimation of atmospheric inputs based on APN data

LRTAP PROJECT DESCRIPTIONTITLE

Biogeochemical Investigation in a Boreal Forest Ecosystem

PRINCIPAL INVESTIGATOR

NAME: Dr. Gilles Robitaille

PHONE: (418) 648-5826

AGENCY AND DEPARTMENT: Canadian Forestry Service

ADDRESS: Laurentian Forest Research Centre
1055 PEPS Street, C.P. 3800, Ste. Foy
Quebec G1V 4C7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Laval University, Montmorency Experimental
Forest, Inland Waters Directorate Quebec
Region, Atmospheric Environment Service

DURATION: Long term continuous

APPROXIMATE COST PER YEAR: \$40,000

PROJECT OBJECTIVES/DESCRIPTION

This investigation takes place in a balsam forest ecosystem under typical boreal climate conditions. The site is located 80 km north of Quebec in the Laurentide reserve at the Montmorency Experimental Forest. More specifically at the Lake Laflamme catchment. The starting date was December 1980.

This study was designed to determine the potential for nutrient cycle perturbation for the input of ions via precipitation, in a boreal forest ecosystem. The approach used monitors, the cycle of various acidifying and the nutrient ions throughout the hydrological and biological pathways. The biological pathway means return of nutrient elements via litter fall, the storage of these elements in the vegetation biologically active soil. The hydrological pathway means input to the system via wet deposition i.e. rain and snow (fog and dry deposition to be considered in the future), movement of ions within the forest and the soil system and the export of these ions out of the systems.

Anticipated Results:

This investigation will give us much needed information on:

- nutrient input via long range transported rain and snow to a boreal forest ecosystem
- nutrient stores and movements within the system
- potential acidification and nutrient export for this system
- mobilization of nutrient in a podzol in relation to nutrient input via throughfall
- on nutrient distribution from the organic horizon to the mineral soil
- nutrient deficiency
- long term fluctuations of nutrient cycles for a coniferous forest
- the potential effect on biomass formation of observed anomalies in the above

LRTAP PROJECT DESCRIPTION

TITLE

Development for Lac Laflamme Basin of a Model for Predicting the Impact of Acid Precipitation on Surface Water Quality (1985 Springmelt)

PRINCIPAL INVESTIGATOR

NAME: Jean-Yves Charette

PHONE: (418) 648-3921

AGENCY AND DEPARTMENT: Inland Waters Directorate, Quebec Region
Environmental Conservation Service
Environment Canada

ADDRESS: 1141, Route de l'Eglise - 8th floor
Ste-Foy, Quebec
G1V 4H5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Gérald Jones - INRS-Eau
Jean Stein - Laval University

DURATION: April 1984 - March 1986

APPROXIMATE COST PER YEAR: \$ 101,500 (0.9 PY)

PROJECT OBJECTIVES/DESCRIPTION

- To develop a model for predicting the impact of acid precipitation on surface water quality in order to assess and predict the impact of the LRTAP program's target sulfate loadings on a boreal ecosystem like Lac Laflamme, and correct the target loadings.

Methods: (1985 Springmelt)

- Measure the hydrometeorological parameters needed for the 1973 Anderson model; validate the model
- Adjust the HYFOR and VSAS-2 models to predict quantitative changes in surface waters
- Measure the changes in surface water quality during springmelt
- Compare the quantitative and qualitative changes in surface waters
- Combine the measurements of surface water quality with the quantitative measurements of the HYFOR and VSAS-2 models
- Construct the elements of a model for predicting changes in surface water quality, on the basis of the HYF qualitative changes in surface waters

DESCRIPTION DU PROJET DE TADPA

TITRE

Le rôle du sol et du sous-sol dans la qualité des eaux de ruissellement pendant la fonte printanière

NOM DU CHERCHEUR RESPONSABLE: Yves Thomassin PHONE: (418) 654-2524

MINISTRE, ORGANISME OU SERVICE: INRS-Eau (Institut national de la recherche scientifique)

ADRESSE: 2700, rue Einstein
C.P. 7500
Sainte-Foy, Québec
G1V 4C7

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): H.G. Jones (INRS-Eau), J. Roberge
(Université Laval; J.Y. Charette (Environnement
Canada)

DURÉE DE CHAQUE PHASE: 1984 - 1987 (Thèse de doctorat)

COÛT APPROXIMATIF (PAR ANNÉE): \$ 45,000

OBJECTIFS DU PROJET ET DESCRIPTION

Développement d'un modèle prédictif de l'impact des précipitations acides sur lesère. caractéristiques physico-chimiques des eaux de surface lors de la fonte printanière

Méthode de travail:

Bassin du Lac Laflamme(Québec), études "in situ" (lysimètres) de la quantité de la qualité (SO_4^{2-} , NO_3^- , Cl^- , H^+ et Al) des eaux de fonte, des eaux de percolation du sol organique et du sol minéral et des eaux de ruissellement au printemps. Etudes complémentaires d'interaction sol-eau en laboratoire. Intégration des flux hydrogéochimiques dans un modèle quantitatif d'écoulement.

Résultats prévus:

Détermination des rôles respectifs du sol organique et du sol minéral à la qualité des eaux d'écoulement printanier.

PROJECT NUMBER
272

SUBJECT CODE
4.2

LRTAP PROJECT DESCRIPTION

TITLE

Modélisation quantitative et qualitative de la fonte de la neige

PRINCIPAL INVESTIGATOR

NAME: J. Stein

PHONE: (418) 656-2945

AGENCY AND DEPARTMENT: Université Laval

ADDRESS: 0870 Pavillon Vachon
Ste-Foy, Québec
G1k 7P4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

H.G. Jones, INRS-eau
A. Plamondon, Université Laval

DURATION: on going

APPROXIMATE COST PER YEAR: \$80,000

PROJECT OBJECTIVES/DESCRIPTION

To predict the acidity (H^+ , SO_4 , NO_3) concentration of snowmelt water at the base of a snowpack in a forested watershed. The Laval team is working on the quantitative aspects of the project while the INRS-eau team is dealing with the chemical aspects. Two quantitative snowmelt models are being used now and both were developed by Dr. Anderson: one is a temperature index model (SNOW 17) while the other is a energy balance model. All the input and output data are taken at the Lake Laflamme basin to calibrate and validate these models.

DESCRIPTION DU PROJET DE TADPA

TITRE

Étude du comportement comparatif des anions d'acides fortes (SO_4^{2-} , NO_3^- et Cl^-) dans les eaux de surface lors de la fonte printanière

NOM DU CHERCHEUR RESPONSABLE: Yves Bédard PHONE: (418) 654-2524

MINISTRE, ORGANISME OU SERVICE: INRS-Eau (Institut national de la recherche scientifique)

ADRESSE: 2700, rue Einstein
C.P. 7500
Sainte-Foy, Québec
G1V 4C7

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): H.G. Jones (INRS-Eau), J. Roberge
(Université Laval; J.Y. Charette (Environnement
Canada)

DURÉE DE CHAQUE PHASE: 1984 - 1986 (Thèse de maîtrise)

COÛT APPROXIMATIF (PAR ANNÉE): \$25,000

OBJECTIFS DU PROJET ET DESCRIPTION

Établir la contribution relative des réservoirs d'eau de précipitation, du couvert de neige, du sol et du sous-sol à l'acidité des eaux de ruissellement lors de la fonte de neige au printemps.

Bassin du Lac Laflamme (Québec), études quantitatives et qualitatives des précipitations, eaux de fonte, eaux, souterraines et eaux de ruissellement pendant la fonte de neige. Etablissement du bilan hydrogéochimique du flux de SO_4^{2-} , NO_3^- , Cl^- , et H^+ .

Établir plus précisément le rôle des eaux souterraines dans le flux d'acidité printanier au Lac Laflamme.

LRTAP PROJECT DESCRIPTION

TITLE

Application of Quebec Terrestrial Data Base to Modelling of Watershed Responses to LRTAP

PRINCIPAL INVESTIGATOR

NAME: R.G. Hélie

PHONE: (819) 997-2320

AGENCY AND DEPARTMENT: Lands Directorate
Environment Canada

ADDRESS: Ottawa, Ontario
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Dr. A. Fraser
Inland Waters Directorate
Burlington, Ontario

DURATION: Project initiated in 1985

APPROXIMATE COST PER YEAR: 1985-86 0.5 (P/Y) and \$12,000

PROJECT OBJECTIVES/DESCRIPTION

- (1) To Provide terrestrial data for five pilot watersheds in Southern Quebec in support of field testing of the Cation Denudation Ratio (CDR) aquatic response model by Inland Waters Directorate.
- (2) To assist in development of a predictive model for potential aquatic ecosystem response using combined terrestrial/aquatic data sets across eastern Canada.

LRTAP PROJECT DESCRIPTION

TITLE

Kejimkujik Basin Studies

PRINCIPAL INVESTIGATOR

NAME: T.A. Clair

PHONE: (506) 388-6606

AGENCY AND DEPARTMENT: Inland Waters Directorate, Water Quality Branch
Environmental Conservation Service
Environment Canada

ADDRESS: P.O. Box 861
Moncton, New Brunswick
E1C 8N6

COOPERATIVE AGENCIES AND INVESTIGATORS (IF APPLICABLE): WRB - AR - D. Ambler, NWRI - D. Lam

DURATION: Ongoing

APPROXIMATE COST PER YEAR: 2 PY, \$50,000 O&M, \$13,000 capital

PROJECT OBJECTIVES/DESCRIPTION

To provide data necessary for the interpretation of organic acid influence on freshwaters and for the modelling of hydrological effects on basin water acidity and aluminum speciation in brown waters.

Methods:

Weekly sampling of a number of streams in the Kejimkujik Park Region, along with weekly sampling of the snowpack during winter.

LRTAP PROJECT DESCRIPTION

TITLE

Kejimikujik Watersheds Study. Biological, Nutrient and Chemical Baseline Characterization, Biological Effects. Analysis and Synthesis.

PRINCIPAL INVESTIGATOR

NAME: Joseph J. Kerekes

PHONE: (902) 426-6356

AGENCY AND DEPARTMENT: Environment Canada, Environmental Conservation Service, Canadian Wildlife Service, Atlantic Region

ADDRESS: c/o Biology Department
Dalhousie University
Halifax, Nova Scotia
B3H 4J1

COOPERATIVE AGENCIES AND INVESTIGATORS (IF APPLICABLE): Dalhousie University: Dr. Freedman, Dr. Blouin
Inland Waters Directorate: Drs. Bourbonniere, Pollock, Wong

DURATION: 1985 - 1987

APPROXIMATE COST PER YEAR: A Base \$28,000 - B Base \$35,900 \$5,000 Cap.

PROJECT OBJECTIVES/DESCRIPTION

Provide baseline characterization of the biota in the Kejimikujik watershed and define seasonal and annual changes of water quality features relevant to the biota. Determine the role of acidity on the phosphorus content and phosphorus release in lake sediments in lakes of different pH and organic acid levels.

Analyse and synthesize the results of biological studies (zooplankton, phytoplankton, macrophytes, planktonic primary production, amphibians, fish) and water features in the Kejimikujik study lakes obtained between 1979 and 1983. Measure phosphorus content and release from lake sediments and elucidate role of acidity in controlling productivity in lakes and wetlands in Nova Scotia.

LRTAP PROJECT DESCRIPTIONTITLE

LRTAP, Wetlands and Land Use Relationships in SW Nova Scotia Watersheds

PRINCIPAL INVESTIGATOR

NAME: I. Kessel-Taylor

PHONE: (819) 997-2320

AGENCY AND DEPARTMENT: Lands Directorate
Environment Canada

ADDRESS: Lands Directorate
Environment Canada
Ottawa, Ontario
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Canadian Wildlife Service, Atlantic Region
Inland Waters Directorate, Atlantic Region

DURATION: Project initiated November 1984

APPROXIMATE COST PER YEAR: 1985-86 0.4 (P/Y), \$6,000

PROJECT OBJECTIVES/DESCRIPTION

1. To identify the role of wetlands in acidification of aquatic systems in SW Nova Scotia since 1960 in 10 selected watersheds which have had significant salmon stocks decline.
2. To examine role of historical land use change in alteration of watershed water chemistry since settlement using the Clyde River Watershed as a case study.
3. To prepare a summary report for publication on statistical interrelationships of variation in water chemistry parameters, land use change and measurable wetland factors with time.

LRTAP PROJECT DESCRIPTIONTITLE

Hydrologic and Chemical Characteristics of Four Watersheds Drained by Acidic Brownwater Streams

PRINCIPAL INVESTIGATOR

NAME: Bill Freedman

PHONE: (902) 424-3829

AGENCY AND DEPARTMENT: Institute for Environmental Studies
and Department of Biology
Dalhousie University

ADDRESS: Dalhousie University Halifax, Nova Scotia B3H 4J1
Halifax, Nova Scotia B3H 4J1

COOPERATIVE AGENCIES C. Stewart, U. Prager, and T. Clair
AND INVESTIGATORS
(IF APPLICABLE): Funding: Water Quality Branch
Environment Canada

DURATION: 1984-85

APPROXIMATE COST PER YEAR: \$15,000

PROJECT OBJECTIVES/DESCRIPTION

To statistically analyze, summarize, and interpret long-term data for four Nova Scotia Watersheds. Examination of annual and seasonal patterns for all major chemical constituents, examine interrelationships between constituents, and between constituents and water flow.

SUBJECT CODE
4.2

PROJECT NUMBER
279

LRTAP PROJECT DESCRIPTION

TITLE

Federal LRTAP Calibrated Watersheds: Historical Land Use Perspective

PRINCIPAL INVESTIGATOR

NAME: J. Moyes (Contractor)

PHONE: (819) 997-2320

AGENCY AND DEPARTMENT: Lands Directorate
Environment Canada

ADDRESS: Ottawa, Ontario

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Initiated May 1985

APPROXIMATE COST PER YEAR: 1985-86 0.1 (P/Y), \$8,000

PROJECT OBJECTIVES/DESCRIPTION

To record land use changes and ecological representativeness of each of the five federal calibrated watershed sites (ELA, Dorset, Turkey Lakes, Lac Laflamme, and Kejimikyik-Moose Pit Brook). Periods of photogrammetric record are 1920-1950, 1950-1980).

To prepare maps and report summarizing results of aerial photographic analysis.

LRTAP PROJECT DESCRIPTIONTITLE

Geochemical Controls of Aquatic System Response to Acid Rain

PRINCIPAL INVESTIGATOR

NAME: Dr. D.S. Jeffries

PHONE: (416) 637-4397

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1981 - 1986

APPROXIMATE COST PER YEAR: \$37,000

PROJECT OBJECTIVES/DESCRIPTION

Long-range transport of atmospheric pollutants is causing acidic deposition to occur in much of southern Ontario, Quebec, and the Maritime Provinces. The rate of acidification of the receiving surface waters is poorly understood. Long and short term acidification can be expected to affect biota in different ways.

The project aims to develop an understanding of the geochemical response of drainage basins and associated lakes to acid precipitation and atmospheric loading of other contaminants. This ongoing study will focus on delineating the important factors controlling both long and short-term acidification of basins. As currently formulated, major reports on findings will be produced in 1985 and 1986.

LRTAP PROJECT DESCRIPTION

TITLE

Watershed Acidification Models

PRINCIPAL INVESTIGATOR

NAME: D.C.L. Lam

PHONE: (416) 637-4241

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1982 - 1987

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

The goals of this program are:

1. To extend and verify the Turkey Lakes hydrological model for other watersheds in Canada; to define and compare the pathways with data from Turkey Lakes, Dorset, Lac Laflamme and Mersey River areas, pending on data availability, by March 1986.
2. To continue development of hydro-geochemical acidification and water quality model components affecting the pH, alkalinity and major ions, leading to estimates of stress-response relationships.

The primary requirement of the Canada-U.S. Memorandum of Intent concerning Transboundary Air Pollution is the specification of ecosystem tolerance and response to LRTAP stresses. The modelling efforts are necessary to synthesize the information into comprehensive regime response simulation. This model synthesis is necessary to provide the needed linkage of LRTAP stress and aquatic regime response in a basin systems scale.

LRTAP PROJECT DESCRIPTIONTITLE

Aquatic Effects of Acidic Precipitation Models and Monitoring

PRINCIPAL INVESTIGATOR

NAME: Mary Thompson

PHONE: (416) 637-4513

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1979 - 1989

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

To assess the impact of acid precipitation upon aquatic resources of eastern Canada, develop quantitative assessments of the proportions of such resources at risk at various deposition rates, to evaluate natural background levels of sulfate deposition, and to continue to validate the CDR model.

Method:

Application of the CDR model to organic waters: evaluation of the amount of A^- and the effect of A^- on Gran alkalinity (acidity) titrations.

SUBJECT CODE
4.2

PROJECT NUMBER
283

LRTAP PROJECT DESCRIPTION

TITLE

Large-scale Acid Rain Risk Assessment

PRINCIPAL INVESTIGATOR

NAME: C.K. Minns

PHONE: (416) 637-4730

AGENCY AND DEPARTMENT: Fisheries and Oceans
Great Lakes Fisheries Research Branch

ADDRESS: Canadian Centre for Inland Waters
867 Lakeshore Road, P.O. Box 5050
Burlington, Ontario
L7R 4A6

COOPERATIVE AGENCIES Environment Canada
AND INVESTIGATORS Ontario Ministry of Natural Resources
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$7,000

PROJECT OBJECTIVES/DESCRIPTION

To develop a method of assessing and predicting impact of atmospheric acid deposition on the fisheries and fish habitat throughout the sensitive areas of eastern Canada.

Description:

Complete manuscripts describing results of latest modelling effort (1984-85). Prepare poster paper for Muskoka '85 Acid Rain Conference describing results of the extensive modelling efforts. Modify current model to predict effects of spring snow melt/caged fish bioassays on a regional basis. Collaborate with Ontario Ministry of Natural Resources to develop improved predictors of:

1. fish spp presence/absence (biogeographical and habitat);
2. biomass, production, and yield of fish assemblages.

Apply current model to datasets collected for mesocosm watershed with special attention to network links, heterogeneity in sulphate levels, and refine threshold impact models viz à viz fish.

LRTAP PROJECT DESCRIPTION

TITLE

Operational Acid Precipitation Models: Review and Enhancement

PRINCIPAL INVESTIGATOR

NAME: A.S. Fraser

PHONE: (416) 637-4513

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
Canada
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: April, 1985 - March 86

APPROXIMATE COST PER YEAR: \$ 37,000

PROJECT OBJECTIVES/DESCRIPTION

- to evaluate the Cation Denudation Rate (CDR) model under varied conditions in the Province of Quebec, determining the applicability of modifying factors upon the model.

Under the terms of the Canada-U.S. Memorandum of Intent concerning transboundary air pollution the evaluation and interpretation of the data bases in concert with applications of models of acid sensitivity will provide the basis of policy development.

SUBJECT CODE
4.2

PROJECT NUMBER
285

LRTAP PROJECT DESCRIPTION

TITLE

Canada-Norwegian Project RAIN

PRINCIPAL INVESTIGATOR

NAME: F.C. Elder
P.J. Dillon

PHONE: (416) 637-4212
(416) 965-2114

AGENCY AND DEPARTMENT:

National Water Research Institute,
Canada Centre for Inland Waters

Ontario Ministry of Environment

ADDRESS: P.O. Box 5050
Burlington, Ontario
Canada

135 St. Clair Street West
Toronto, Ontario
Canada

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. Richard Wright
Norwegian Institute for Water Research

DURATION: 1983 - 1987

APPROXIMATE COST PER YEAR:

Operating costs \$225,000
Canadian contribution: Ontario Ministry of
Environment \$60,000
Environment Canada \$60,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the rate of response of the chemistry of runoff waters from small catchments to changes in loading of strong acids. The results will provide for validation of basin acidification models.

An enclosed (greenhouse) catchment is deacidified while another catchment is acidified under controlled conditions. The response of outflow water chemistry is monitored.

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Environmental Sulphur on Farm Animals

PRINCIPAL INVESTIGATOR

NAME: Dr. A.A. Khan

PHONE: (403) 632-6761

AGENCY AND DEPARTMENT: Animal Sciences Wing
Alberta Environmental Centre

ADDRESS: Bag 4000
Vegreville, Alberta
T0B 4L0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Five years

APPROXIMATE COST PER YEAR: \$150,000

PROJECT OBJECTIVES/DESCRIPTION

This study investigates the role of indirect exposure to sulphur containing emissions on Alberta cattle, specifically the incidence of certain reproductive and infectious diseases, reduced productivity and trace element nutritional deficiencies. The role of direct exposure of sulphur containing emissions on the health and productivity of cattle is also under investigation.

SUBJECT CODE
4.3

PROJECT NUMBER
287

LRTAP PROJECT DESCRIPTION

TITLE

Study of Metal Accumulation in Wild Mink and Otter in Ontario Relative to Environmental Loading and Availability Through Lake Acidification

PRINCIPAL INVESTIGATOR

NAME: Dr. Christopher Wren

PHONE: (519) 837-2756

AGENCY AND DEPARTMENT: C.D. Wren Associates

ADDRESS: 12 Harrow Court
Guelph, Ontario
N1G 2Z1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE)

Institute for Environmental Studies
Universtiy of Toronto
Funded through Canadian Wildlife Service

DURATION: 1 year April 1985 - March 31, 1986

APPROXIMATE COST PER YEAR: \$ 34,000

PROJECT OBJECTIVES/DESCRIPTION

Final year of a 3 year project to determine tissue levels of Pb, Cd and Hg in fish-eating mammals and their food in Ontario. Toxicity hazard of observed levels will be evaluated.

LRTAP PROJECT DESCRIPTION

TITLE

Metal Accumulation in Wild Mink and Otter in Ontario Relative to Environmental Loading and Availability.

PRINCIPAL INVESTIGATOR

NAME : C.D. Wren and P.M. Stokes

PHONE : (416) 978-6526

AGENCY AND DEPARTMENT : University of Toronto, Institute for Environmental Studies

ADDRESS : Haultain Bldg.
170 College Street
Toronto, Ontario
M5S 1A4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): K. Fischer, Canadian Wildlife Service
National Wildlife Research Centre
100 Gamelin Blvd., Hull P.Q.

DURATION : To be completed in August 1986

APPROXIMATE COST PER YEAR :

PROJECT OBJECTIVES/DESCRIPTION

Determine the effect of atmospheric deposition of metal and increased metal mobility due to acidification on metal burdens in mink and otter.

Compare metal levels in typical food items of mink and otter between study sites.

During the two trapping seasons of 1983/84 and 1984/85 approximately 100 mink and 90 otter were collected from four areas in Ontario. In addition, some 160 samples of food items including macroinvertebrates, small mammals and fish have been collected from the study areas.

Mercury analysis of mink and otter tissues collected in 1983/84 is completed and tissue analysis for Pb and Cd is in progress. The pattern of body metal burdens was similar in both mink and otter. Mercury levels were generally highest in kidney, followed by liver, muscle and brain.

The current year (1985/86) will be devoted to completion of tissue and food item metal analysis, age analysis of animals and breakdown of harvest data by area. The final report will address the potential of these toxic metals to accumulate in wildlife, and assess the toxicity hazard of current environmental metal levels to piscivorous furbearers. This information will be useful to more clearly identify the potential biological effects of acid precipitation on wildlife resources.

SUBJECT CODE
4.3

PROJECT NUMBER
289

LRTAP PROJECT DESCRIPTION

TITLE

The Effects of Acidic Precipitation on Wetland-dwelling Wildlife

PRINCIPAL INVESTIGATOR

NAME : D.K. McNicol, P.J. Blancher,
B.E. Bendell

PHONE : (613) 998-4693

AGENCY AND DEPARTMENT : Department of the Environment, Canadian Wildlife
Service

ADDRESS : Ontario Region
1725 Woodward Drive
Ottawa, Ontario
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

National Wildlife Research Centre, Great Lakes Forestry
Research Centre, Ontario Ministry of Natural Resources,

DURATION : 1985 to 1988

APPROXIMATE COST PER YEAR : 1985/86 B Base \$27,000

PROJECT OBJECTIVES/DESCRIPTION

To elucidate the effects of anthropogenic acidification on sensitive wildlife species and their prey inhabiting wetlands subject to natural acidification processes.

1. To characterize bog and fen habitats in two study areas (Ranger Lake NE of Sault Ste. Marie and Lake Wanapitei NE of Sudbury) receiving different inputs of anthropogenic acids, and relate observed differences in water chemistry and vegetation to input levels.
2. To document changes in the aquatic food chain related to increased acidification.
3. To determine responses of wetland wildlife to acidification-induced changes in wetland chemistry.

Forty-one wetlands were examined in November 1984 for water chemistry. Studies of wetland fauna and their invertebrate prey began in 1985. Efforts have concentrated on migratory birds, which rely on invertebrate foods.

PROJECT NUMBER
290

SUBJECT CODE
4.3

LRTAP PROJECT DESCRIPTION

TITLE

The Effects of Acidic Precipitation on Waterfowl Populations in Northern Ontario

PRINCIPAL INVESTIGATOR

NAME : D.K. McNicol, R.K. Ross, B.E. Bendell PHONE : (613) 998-4693

AGENCY AND DEPARTMENT : Department of the Environment, Canadian Wildlife Service

ADDRESS : Ontario Region
1725 Woodward Drive
Ottawa, Ontario
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

National Wildlife Research Centre, Great Lakes Forestry
Research Centre, Ontario Ministry of Natural Resources,
Ontario Ministry of Environment, Trent University,
University of Guelph, Long Point Bird Observatory.

DURATION : 1985 - 1986

APPROXIMATE COST PER YEAR : A Base \$28,100 - B Base \$36,500

PROJECT OBJECTIVES/DESCRIPTION

1. To determine relationships between acid rain levels and the status of waterfowl populations in northern Ontario.
2. To examine the mechanisms by which waterfowl respond to changes in the chemical status of their habitat arising from acidification.
3. To determine the effects of acidification on the abundance of major invertebrate prey of waterfowl.
4. To develop a biomonitoring procedure which measures the long term impact of acidic inputs on waterfowl, under current or revised emission guidelines, using aquatic biota which integrate the combined effects of water quality and trophic structure on waterfowl breeding capabilities.

To identify the mechanisms by which acid precipitation affects waterfowl, through its impact on prey species, food chain studies are being conducted in 2 areas which receive different acid loading levels. Ranger Lake, northeast of Sault Ste. Marie, is a largely unaffected sensitive area, while Lake Wanapitei, northeast of Sudbury, receives high atmospheric loading levels, which has caused considerable habitat acidification and loss of aquatic biota.

Current investigations are aimed at determining whether acidity is limiting the abundance of major invertebrate prey at crucial stages in the nesting cycle, hence reducing the utilization of such acidic wetlands by certain waterfowl species.

DESCRIPTION DU PROJET DE TADPA

TITRE

L'acidité des Lacs et les Canards

NOM DU CHERCHEUR RESPONSABLE: Jean-Luc DesGranges PHONE : (418) 648-3914

MINISTRE, ORGANISME OU SERVICE:

ADRESSE : Service canadien de la faune
1141, route de l'Eglise
C.P. 10100, 9e étage
Sainte-Foy, Quebec
G1V 4H5

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S):

- 1) Canards Illimités
- 2) Ministère du Loisir, de Chasse et de la
Pêche du Quebec

DURÉE DE CHAQUE PHASE: Jusqu'en 1988

COÛT APPROXIMATIF (PAR ANNÉE): \$100,000

OBJECTIFS DU PROJET ET DESCRIPTION

En 1984 et 1985, nous avons élevé plusieurs canetons de Canard noir (Anas rubripes) et de Garrot commun (Bucephala clangula) sur des lacs acides et neutres dans lesquels les populations d'Ombre de fontaine (Salvelinus fontinalis) ont été manipulées. Nous avons pu ainsi déterminer comment l'acidité et la compétition avec les poissons affectent l'alimentation et la croissance des canetons. Il semble que la forte acidité et la présence de poissons soient toutes deux requises pour entraver leur développement.

D'ici 1988, nous voulons trouver des solutions aux torts causés aux canards et aux poissons par l'acidification des lacs. Le chaulage, la fertilisation et la création de secteurs peu profonds autour des lacs sont des avenues que nous explorerons afin de permettre le maintien et la cohabitation des populations de canards et de poissons du bouclier laurentien.

LRTAP PROJECT DESCRIPTIONTITLE

Effects of Metal Mobilization through Acid Precipitation on Avian Physiology and Reproduction.

PRINCIPAL INVESTIGATOR

NAME : A.M. Scheuhammer

PHONE : (819) 997-6079

AGENCY AND DEPARTMENT : National Wildlife Research Centre
Canadian Wildlife Service

ADDRESS : 100 Gamelin Boulevard
Hull, Quebec
K1A 0E7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

D. McNicol/K. Ross
Canadian Wildlife Service, Ontario Region
1725 Woodward Drive
Ottawa, Ontario K1A 0E7

DURATION : 4 years

APPROXIMATE COST PER YEAR : \$3,000 PY/ \$80,000 - non-salary O&M
\$15,000 - Capital

PROJECT OBJECTIVES/DESCRIPTION

1. To investigate possible physiological and reproductive effects in birds of chronic, low-level dietary exposure to a combination of heavy metals (mercury, cadmium, lead).
2. To investigate the suitability of using egg contents and/or fledgling feathers and tissues as monitors of dietary metal exposure in birds.

Aviary-housed Ring doves and Zebra finches will be used in controlled, laboratory studies to establish dose-response relationships between dietary metal levels and the accumulation of metals in eggs, feathers and selected tissues, as well as to establish the levels of dietary Hg, Cd and Pb at which reproductive impairment might be expected to occur.

Groups of adult male-female pairs will be fed either a control diet of one of a series of experimental diets supplemented with Hg, Cd and Pb for 4 weeks prior to breeding. Birds will then be maintained on their respective diets during 2 complete reproductive cycles. Various parameters of reproductive success will be monitored. Some eggs will be sampled and shells, yolks, and albumen processed for metal estimations. After fledging, adults and young will be sacrificed and blood, liver, kidney, bone and feather samples will be processed for metal estimations and measurement of various marker enzymes. Results from these studies should help to establish useful monitoring procedures which could subsequently be tested under field conditions.

SUBJECT CODE
4.3

PROJECT NUMBER
293

LRTAP PROJECT DESCRIPTION

TITLE

Effects of Acidity and Associated Water Chemistry on Amphibian Occurrence and Reproduction

PRINCIPAL INVESTIGATOR

NAME: Bill Freedman

PHONE: (902) 424-3829

AGENCY AND DEPARTMENT: Institute for Environmental Studies
and Department of Biology
Dalhousie University,
Halifax, N.S., B3H 4J1

ADDRESS:

COOPERATIVE AGENCIES J. Dale, J. Kerekes
AND INVESTIGATORS
(IF APPLICABLE): funding: Canadian Wildlife Service

DURATION: 1982-1985

APPROXIMATE COST PER YEAR: \$10,000

PROJECT OBJECTIVES/DESCRIPTION

- a) Survey of field sites in Nova Scotia. Data were collected on occurrence of amphibian species, and chemistry of water. Where possible, information was also collected on breeding status.
- b) Laboratory bioassays seven species. Variables included pH, temperature, aluminum, and calcium. Effects were examined for egg hatching, larval survival and development, and adult survival.

Report available:

Dale, J., B. Freedman, and J. Kerekes. 1984. Acidity and water chemistry of amphibian breeding rites in Nova Scotia. Canadian Journal of Zoology, 63: 97-105.

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SECTION 5

HEALTH EFFECTS

LRTAP PROJECT DESCRIPTIONTITLE

Health Effects of Sulphur-Containing Emissions (Inhalation Toxicology)

PRINCIPAL INVESTIGATOR

NAME: Dr. M. Prior

PHONE: (403) 632-6761

AGENCY AND DEPARTMENT: Animal Sciences Wing
Alberta Environmental Centre

ADDRESS: Bag 4000
Vergreville, Alberta
T0B 4L0

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Five years +

APPROXIMATE COST PER YEAR: \$200,000

PROJECT OBJECTIVES/DESCRIPTION

The program will examine, in vivo and in vitro, the effects of short-term and long-term inhalation exposures of hydrogen sulphide and other sulphur compounds on laboratory rodents and livestock. The studies of the effects on the reproductive systems, lung defence mechanisms, pulmonary function, biochemistry and pathological changes are underway. Inhalation studies to determine toxic effects of gases, vapours, and particulates will be extrapolated to man.

PROJECT NUMBER

295

SUBJECT CODE

5.1

LRTAP PROJECT DESCRIPTION

TITLE

Air Pollution and Hospital Admissions

PRINCIPAL INVESTIGATOR

NAME: Dr. D.V. Bates

PHONE: (604) 228-4925

AGENCY AND DEPARTMENT: University of British Columbia
Department of Health Care & Epidemiology

ADDRESS: Department of Health Care & Epidemiology
MATHER Building
University of British Columbia
V6T 1W5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Mr. R. Sizto
Funded by Medical Research Council of Canada

DURATION: 3 years

APPROXIMATE COST PER YEAR: \$42,000

PROJECT OBJECTIVES/DESCRIPTION

Studies involve:

- a) Continuing analyses of air pollution and hospital administration in Southern Ontario.
- b) Emergency hospital units in Vancouver in relation to air pollution data.

LRTAP PROJECT DESCRIPTION

TITLE

An Integrated Approach to the Investigation of Lung Function Responses of Sensitive Subjects to Diverse Air Pollutants

PRINCIPAL INVESTIGATOR

NAME: Frances Silverman, P. Corey

PHONE: (416) 979-1495

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment

ADDRESS: The Gage Research Institute
223 College Street
Toronto, Ontario
M5T 1R4

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1 year

APPROXIMATE COST PER YEAR: \$75,000

PROJECT OBJECTIVES/DESCRIPTION

To integrate and analyse data on air pollution exposure and health effects on asthmatics and non-asthmatics from a number of studies on different pollutants and using 2 experimental approaches.

To assess existing data base and identifying future research.

To establish approaches, specific technology and protocols which would be the most relevant for future work.

The two experimental approaches include:

- a) environmental chamber studies
- b) field studies using four measures of exposures (personal, inside and outside homes, and central downtown Toronto fixed location site).

LRTAP PROJECT DESCRIPTION

TITLE

Acute Changes in Respiratory Health Associated With Elevated Levels of LRTAP:
A Summer Camp Study

PRINCIPAL INVESTIGATOR

NAME: Mr. Mark E. Raizenne

PHONE: (613) 990-8859

AGENCY AND DEPARTMENT: LRTAP Health Effects Section
Environmental Health Directorate
National Health and Welfare

ADDRESS: 64-HPB Building
Tunney's Pasture
Ottawa, Ontario
K1A 0L2

COOPERATIVE AGENCIES Environment Canada
AND INVESTIGATORS Ontario Ministry of Environment
(IF APPLICABLE): Harvard School of Public Health
Department of Environmental Science & Physiology

DURATION: April, 1986 - December, 1986. Field work: July - August, 1986

APPROXIMATE COST PER YEAR: \$100,000

PROJECT OBJECTIVES/DESCRIPTION

The objective of this study is to characterize acute changes in respiratory health associated with transient elevated levels of acidic pollutants in a population of children at a summer residential camp in southwestern Ontario during July-August, 1986. The lung function, respiratory symptomatology, and activity patterns will be measured regularly for each child, along with continuous monitoring of airborne pollutant, in particular, respirable acid sulfates and sulfuric acid, ozone, SO₂, and NO_x. The concentration and speciation of acid sulfates will be documented through the use of a continuous acid aerosol/sulfate monitor developed for field studies by Harvard School of Public Health.

LRTAP PROJECT DESCRIPTION

TITLE

The Effects of Chronic Exposure to LRTAP on the Respiratory Health of School Children

PRINCIPAL INVESTIGATOR

NAME: Dr. B. Stern

PHONE: (613) 990-8859

AGENCY AND DEPARTMENT: LRTAP Health Effects Section
Environmental Health Directorate
National Health and Welfare

ADDRESS: 64-HPB Building
Tunney's Pasture
Ottawa, Ontario
K1A 0L2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Environment Canada
Saskatchewan Environment
Ontario Ministry of Environment

DURATION: May, 1985 - December, 1986

APPROXIMATE COST PER YEAR: \$600,000

PROJECT OBJECTIVES/DESCRIPTION

The purpose of this study is to investigate the potential respiratory health effects of chronic exposure to LRTAP. This epidemiological investigation is being conducted in ten communities across Canada: five in southwestern Ontario, a high LRTAP region. Five thousand (5,000) school children in Grades 3-5 inclusive are being studied. There are four major components to this study:

- 1) The administration of a respiratory health questionnaire, completed by a parent, to each of the participating children. The questionnaire will also collect information from each child on potential confounding variables.
- 2) The administration of standard lung function test to each child to measure pulmonary function parameters.
- 3) Air pollution monitoring in the study regions and communities for long range air particles, which are most likely to have an impact on human respiratory health.
- 4) The administration of health diaries to record acute respiratory illnesses over a period of approximately 6 months.

LRTAP PROJECT DESCRIPTIONTITLE

The Development of Size Fractionation Air Pollution Sampling Equipment for the Characterization of Particle Size Distributions of LRTAP

PRINCIPAL INVESTIGATOR

NAME: Dr. B. Stern

PHONE: (613) 990-8859

AGENCY AND DEPARTMENT: LRTAP Health Effects Section
Environmental Health Directorate
National Health and Welfare

ADDRESS: 64-HPB Building
Tunney's Pasture
Ottawa, Ontario
K1A 0L2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Harvard School of Public Health
Department of Environmental Science & Physiology

DURATION: November, 1985 - March, 1986

APPROXIMATE COST PER YEAR: \$80,000

PROJECT OBJECTIVES/DESCRIPTION

This project is designed to improve the characterization of LRTAP particles in the size range most likely to impact on human health (0.5-2.5 microns). Modelling of the effects of acid deposition on the respiratory health of humans has suggested that acid particle size cuts will be designed and developed to measure and describe particles in the size range of interest. One sampler will be equipped with a pre-inlet humidifier in order to simulate humidity conditions in the human upper respiratory tract. The performance of the samplers will be compared and contrasted in laboratory and field tests. The use of these samplers in 1986 LRTAP acute summer study is planned.

SUBJECT CODE

5.1

PROJECT NUMBER

300

LRTAP PROJECT DESCRIPTION

TITLE

Development of a Theoretical Model to Estimate Excess Mortality due to LRTAP IN Canada

PRINCIPAL INVESTIGATOR

NAME: Dr. Richard T. Burnett

PHONE: (613) 990-8897

AGENCY AND DEPARTMENT: Environmental Health Directorate
National Health and Welfare

ADDRESS: 120-Environmental Health Centre
Tunney's Pasture
Ottawa, Ontario
K1A 0L2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: April, 1985 - April, 1986

APPROXIMATE COST PER YEAR: \$50,000

PROJECT OBJECTIVES/DESCRIPTION

Brookhaven National Laboratories has recently estimated the excess death in Canada due to sulphate deposition from North America to be 4,300 deaths (with a 90% confidence interval of 0-13,000). A subjective health damage function coupled with sulfur dioxide emission levels from power plants yields the desirable estimate. The purpose of this project is to critically evaluate Brookhaven's methods and to suggest and develop alternative methods of analyses.

PROJECT NUMBER
301

SUBJECT CODE
5.1

LRTAP PROJECT DESCRIPTION

TITLE

The Toxicological Assessment of Acid Sulphates, Nitrates and Ozone Using Animal and Human Models

PRINCIPAL INVESTIGATOR

NAME: Dr. B. Stern
Mr. M. E. Raizenne

PHONE: (613) 990-8859

AGENCY AND DEPARTMENT: Environmental Health Directorate
LRTAP Health Effects Section
National Health and Welfare

ADDRESS: Room 64-HPB Building
Tunney's Pasture
Ottawa, Ontario
K1A 0L2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: April, 1985 - Ongoing

APPROXIMATE COST PER YEAR: \$220,000

PROJECT OBJECTIVES/DESCRIPTION

The purpose of this project is to conduct animal and human clinical studies to assess the toxicology of long range transport of air pollutants, individually (e.g. ozone, SO₂, sulphates, nitrates), or as a mixture, and to develop animal and human models that describe and quantify the relationship between LRTAP and the development of respiratory and non-respiratory human health problems. These studies involve the laboratory testing of animals and clinical studies of humans as well as the development of theoretical models.

LRTAP PROJECT DESCRIPTIONTITLE

The Development of Survey Protocols for the Determination of LRTAP Pollutants in Typical Homes

PRINCIPAL INVESTIGATOR

NAME: J.C. Meranger
Mr. M. E. Raizenne

PHONE: (613) 922-1388

AGENCY AND DEPARTMENT: Environmental Health Directorate
National Health and Welfare

ADDRESS: 64-HPB Building
Tunney's Pasture
Ottawa, Ontario
K1A 0L2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): St. Francis Xavier University
Antigonish, Nova Scotia
B2G 1C0

DURATION: 1 year

APPROXIMATE COST PER YEAR: \$33,000

PROJECT OBJECTIVES/DESCRIPTION

Sampling of pollutants will be carried out in several types of homes to define sampling protocol requirements for LRTAP related inorganic pollutants (NO_x, SO₂, respirable particulates).

LRTAP PROJECT DESCRIPTION

TITLE

Effect of Acid Deposition on Well Water and Tap Water Quality in Southcentral Ontario

PRINCIPAL INVESTIGATOR

NAME: J.C. Meranger

PHONE: (613) 922-1388

AGENCY AND DEPARTMENT: Environmental Health Directorate
National Health and Welfare

ADDRESS: 64-HPB Building
Tunney's Pasture
Ottawa, Ontario
K1A 0L2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE): Institute for Environmental Studies
Toronto, Ontario
M5S 1A4

DURATION:

APPROXIMATE COST PER YEAR: \$30,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the trace metal composition of selected well and tap water from southcentral Ontario.

Water samples will be collected from ten communities and analysed for pH, alkalinity, conductivity etc, an' ions and trace elements to provide base-line data.

SUBJECT CODE
5.2

PROJECT NUMBER
304

LRTAP PROJECT DESCRIPTION

TITLE

The Correlation Between Ionic Aluminum and Sulphate in Shallow Water Impacted by Acidic Deposition

PRINCIPAL INVESTIGATOR

NAME: J.C. Meranger

PHONE: (613) 922-1388

AGENCY AND DEPARTMENT: Environmental Health Directorate
National Health and Welfare

ADDRESS: 64-HPB Building
Tunney's Pasture
Ottawa, Ontario
K1A 0L2

COOPERATIVE AGENCIES (Contract under negotiation)
AND INVESTIGATORS
(IF APPLICABLE):

DURATION:

APPROXIMATE COST PER YEAR: \$100,000

PROJECT OBJECTIVES/DESCRIPTION

Preliminary studies have shown high levels of aluminum in areas where ground water is impacted by acid rain.

Several shallow well waters will be obtained to determine the correlation between ionic aluminum and sulphate. Detailed aluminum speciation studies will be made on selected water samples.

PROJECT NUMBER
305

SUBJECT CODE
5.2

LRTAP PROJECT DESCRIPTION

TITLE

The Effects of Acid Precipitation on Drinking Water Quality in Southern New Brunswick

PRINCIPAL INVESTIGATOR

NAME: W.C. Ayer

PHONE: (506) 453-2669

AGENCY AND DEPARTMENT: Environment Services Branch
Environment New Brunswick

ADDRESS: P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1982 - 1986

APPROXIMATE COST PER YEAR: \$ 4,000

PROJECT OBJECTIVES/DESCRIPTION

To determine the quality of drinking water from various sources in southern New Brunswick.

To determine the relationship between water chemistry and the potential for trace metal contamination from piping.

To determine whether a decrease in the water supply pH as occurred.

SUBJECT CODE

5.2

PROJECT NUMBER

306

LRTAP PROJECT DESCRIPTION

TITLE

Metal Mobilization from Home Wellwater Distribution Systems

PRINCIPAL INVESTIGATOR

NAME: Bill Freedman

PHONE: (902) 424-3829

AGENCY AND DEPARTMENT: Institute for Environmental Studies
Department of Biology

ADDRESS: Dalhousie University
Halifax, Nova Scotia
B3H 4J1

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

O. Maessen, R. McCurdy
funding: Dalhousie University

DURATION: 1982-1984

APPROXIMATE COST PER YEAR: \$4,000

PROJECT OBJECTIVES/DESCRIPTION

Four rural communities (2 on granite, 1 on slate, 1 on limestone), 20 wells/community, examined mobilization of Cu, Pb, Cd, Zn from home water distribution system, and related degree of mobilization to major ion chemistry.

-Report available:

Maessen, O., B. Freedman, and R. McCurdy. 1985. Metal Mobilization in Home Well Water Distribution Systems in Nova Scotia. Journal of the American Water Works Association, June: 73-80.

SECTION 6

MATERIALS EFFECTS

SUBJECT CODE

6.0

PROJECT NUMBER

307

LRTAP PROJECT DESCRIPTION

TITLE

Acid Precipitation Effects on Metal Corrosion

PRINCIPAL INVESTIGATOR

NAME: M.S. Kotturi

PHONE: (604) 387-4321

AGENCY AND DEPARTMENT: Ministry of Environment
Enviromental Services Section

ADDRESS: Enviromental Services Section
Waste Management Branch
Ministry of Environment
Parliament buildings
Victoria, B.C. V8V 1X5

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: 1985 - 1989

APPROXIMATE COST PER YEAR: Initial Cost \$9,000

PROJECT OBJECTIVES/DESCRIPTION

The aim of the study is to investigate the corrosion rates of metals of commercial importance at three test sites in British Columbia. The corrosion data will be correlated with precipitation acidity, air quality and related meteorological factors.

NUMÉRO DE PROJET
308

CODE DU SUJET
6.0

DESCRIPTION DU PROJET DE TADPA

TITRE

Corrosion Atmospherique des Metaux

NOM DU CHERCHEUR RESPONSABLE: Dr. J. Hechler PHONE: (514) 641-2280

MINISTRE, ORGANISME OU SERVICE: Institut de Genie des materiaux
Conseil National de Recherches Canada

ADRESSE: 75, De Mortagne
Boucherville, Québec
J4B 6Y4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): U.S. Bureau of Mines

DURÉE DE CHAQUE PHASE: 3 ans

COÛT APPROXIMATIF (PAR ANNÉE): \$30,000

OBJECTIFS DU PROJET ET DESCRIPTION

Sept métaux (cuivre, givre, aluminium, acier au carbone, acier patinalbe, acier galvanisé et aglvalume) sont exposés au site des Lacs Expérimentaux (Ontario). Le but de ce travail est de déterminer l'influence de certains paramètres de la pollution (pH des pluies, déposition de SO₂, et NO_x...) sur la corrosion atmosphérique des métaux. Le site des Lacs Expérimentaux étant un site de faible pollution, les résultats serviront de référence à un travail semblable effectué par le U.S. Bureau of Mines de Washington sur un ensemble de sites moyennement et fortement pollués.

SECTION 7

LIMING

DESCRIPTION DU PROJET DE TADPATITRE

Chaulage de 12 lacs acides en Mauricie

NOM DU CHERCHEUR RESPONSABLE:

Louis Houde
Michel Lemieux

PHONE:

(819) 537-7265
(819) 523-9829

MINISTRE, ORGANISME OU SERVICE:

Ministère du Loisir, de la Chasse et de la
Pêche

ADRESSE:

605, rue de la Station
Shawinigan, Québec
G9N 1V9

648, rue Joffre
La Tuque, Québec
G9X 3P3

COLLABORATEUR(S),

ORGANISME(S) ET CHERCHEUR(S): Direction des relevés aquatiques, (MENVIQ)
Direction des laboratoires, (MENVIQ)

DURÉE DE CHAQUE PHASE:

Amorcée en 1981 - en continue

COÛT APPROXIMATIF (PAR ANNÉE):OBJECTIFS DU PROJET ET DESCRIPTION

Récupérer les lacs pour la pêche sportive
(populations d'omble de fontaine)

Phase 1 - Chaulage avec chaux hydratée d'un lac aux eaux claires (1981); Chaulage avec chaux agricole de lacs aux eaux brunes; petits lacs de tête et lac de grandes dimension (1984...).

Phase 2 - Suivi bimestriel de la physico-chimie des eaux lacustres.

Phase 3 - Analyse et interprétation des données recueillies.

DESCRIPTION DU PROJET DE TADPA

TITRE

Encadrement et Évaluation des Intervention Expérimentales Pour Contrer
L'Acidification du Milieu Aquatique

NOM DU CHERCHEUR RESPONSABLE: Yves Grimard

PHONE: (418) 664-3303

MINISTRE, ORGANISME OU SERVICE: Direction des relevés aquatiques
Ministère de l'Environnement du Québec,
(MENVIQ)

ADRESSE: 3900, rue Marly
Sainte-Foy, Québec
G1X 4E4

COLLABORATEUR(S),
ORGANISME(S) ET CHERCHEUR(S): Ministère des Loisirs, de la Chasse et de la
Pêche

DURÉE DE CHAQUE PHASE: En continue; phase 1: amorcée en 1982 et phase 4:
en 1986

COÛT APPROXIMATIF (PAR ANNÉE):

OBJECTIFS DU PROJET ET DESCRIPTION

Evaluer l'efficacité et les effets secondaires des interventions directes sur le milieu.

Acquérir une expertise technique et scientifique sur différents modes d'interventions directes sur le milieu.

Mettre à la disposition d'intervenants évanuels l'expertise acquise.

Phase 1 - Echantillonnage par les intervenants, de l'eau avant et après intervention

Phase 2 - Fournir aux intervenants, le support de laboratoire pour effectuer les analyses physico-chimiques de l'eau avant et après intervention

Phase 3 - Fournir aux intervenants, évanuels, l'expertise technique et scientifique sur les modes d'intervention directessur le milieu

Phase 4 - PRODUCTION d'un rapport d'évaluation des modes d'interventions directes sur le milieu

SUBJECT CODE
7.0

PROJECT NUMBER
311

LRTAP PROJECT DESCRIPTION

TITLE

Liming to Establish Deacidified Refuges for Threatened Atlantic Salmon Stocks

PRINCIPAL INVESTIGATOR

NAME: W.D. Watt

PHONE: (902) 426-3606

AGENCY AND DEPARTMENT: Department of Fisheries and Oceans
Fisheries Research Branch

ADDRESS: P.O. Box 550
Halifax, N.S. B3J 2S7

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$180,000

PROJECT OBJECTIVES/DESCRIPTION

The preliminary feasibility studies have now been completed for the liming program. The next step is to try a moderate scale demonstration project to establish a deacidified refuge for a threatened Atlantic salmon stock. East River (Chester) is our target for the first refuge. Due to resource limitations, the initial liming process will have to take place over three years, involving spreading of 300-400 tonnes/year, followed by maintenance liming of 50-100 tonnes/year.

SECTION 8

**QUALITY ASSURANCE &
INTERCOMPARISON STUDIES**

SUBJECT CODE
8.0

PROJECT NUMBER
312

LRTAP PROJECT DESCRIPTION

TITLE

Ontario/National Atmospheric Deposition Program (NADP) - Precipitation Sampling Intercomparison

PRINCIPAL INVESTIGATOR

NAME: Dr. Walter Chan

PHONE: (416) 965-1634

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Dr. G. Glass
U.S. E.P.A.
Environmental Research Laboratory
6201 Congdon Blvd.
Duluth, Minnesota 55804

DURATION: Commenced May, 1982

APPROXIMATE COST PER YEAR: No additional cost - Fernberg site is part of regular APIOS Monitoring Network

PROJECT OBJECTIVES/DESCRIPTION

To intercompare precipitation networks operated by the Ontario government and the NADP designated site in Fernberg, Minnesota - their overall compatibility including instrumentation, sample handling and chemical analysis.

Each network has set up its regular instrumentation at Fernberg, Minnesota and handles the sampling according to its regular procedures. Ontario operates on a daily cycle whereas NADP operates on a 7-day cycle.

Samples are analyzed at the respective laboratories.

Final results will be compiled and compared. A report will be published regarding data compatibility.

PROJECT NUMBER
313

SUBJECT CODE
8.0

LRTAP PROJECT DESCRIPTION

TITLE

Ontario/Québec Precipitation Sampling Intercomparison
Intercomparison

PRINCIPAL INVESTIGATOR

NAME: Dr. Walter Chan

PHONE: (416) 965-1634

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Mr. Michel Ferland
Environment Québec
2360 Chemin Sainte-Foy
Québec City, Québec
G1V 4H2

DURATION: Commenced November, 1982

APPROXIMATE COST PER YEAR: \$3,000

PROJECT OBJECTIVES/DESCRIPTION

To intercompare precipitation networks operated by the Ontario and Québec governments - their overall compatibility including instrumentation, sample handling and chemical analysis.

Each network has set up its regular instrumentation at Rapide-des-Hoachims and handles the sampling according to its regular procedures. Ontario operates on a 28-day cycle whereas Québec operates on a 7-day cycle.

Samples are analyzed at the respective laboratories.

Final results will be compiled and compared. A report will be published regarding data comparability.

SUBJECT CODE
8.0

PROJECT NUMBER
314

LRTAP PROJECT DESCRIPTION

TITLE

Ontario/AES Precipitation and Air Sampling Intercomparisons

PRINCIPAL INVESTIGATOR

NAME: Dr. Walter Chan

PHONE: (416) 965-1634

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Atmospheric Environment Service
ARQM Section
4905 Dufferin Street
Downsview, Ontario
M3H 5T4

DURATION:

APPROXIMATE COST PER YEAR: No additional cost - all sites are part of routine sampling networks.

PROJECT OBJECTIVES/DESCRIPTION

To intercompare precipitation and air sampling networks operated by the Ontario and Federal governments - their overall compatibility including instrumentation, sample handling and chemical analysis.

Each network has set up its regular instrumentation at Longwoods (precipitation and air), Dorset (precipitation only) and Turkey Lakes (precipitation only) and handles the sampling according to its regular procedures. Ontario operates on a daily basis whereas AES operates on a 7-day cycle for precipitation at Longwoods and Dorset. Both agencies sample on a daily basis for air sampling at Longwoods, while at Turkey Lakes Ontario operates on a 28-day cycle and AES on a 7-day cycle.

Samples are analyzed at the respective laboratories.

Final results will be compiled and compared. A report will be published regarding data comparability at the various intercomparison sites.

PROJECT NUMBER
315

SUBJECT CODE
8.0

LRTAP PROJECT DESCRIPTION

TITLE

Quality Assurance of APIOS Deposition Networks

PRINCIPAL INVESTIGATOR

NAME: Dr. Walter Chan

PHONE: (416) 965-1634

AGENCY AND DEPARTMENT: Ontario Ministry of the Environment
Air Resources Branch

ADDRESS: 880 Bay Street, 4th Floor
Toronto, Ontario
M5S 1Z8

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR: \$20,000

PROJECT OBJECTIVES/DESCRIPTION

To ensure the collection and reporting of data from the APIOS networks are precise, accurate, representative and complete.

Extensive quality assurance (QA) activities have been implemented via the development of QA Plan and QA Manual. Major activities include:

- routinely scheduled preventive maintenance and calibrations
- estimates of accuracy and precision using co-located sampling, composite handling samples, duplicate samples, field bank sampling, sampling container integrity checks and various special studies
- internal and external performance and system audits
- quality assurance reports and network performance assessments

Estimates of the quality of the data collected from the monitoring program will be reported on an ongoing basis. External and internal audit findings are also reported.

SUBJECT CODE

8.0

PROJECT NUMBER

316

LRTAP PROJECT DESCRIPTION

TITLE

Acid Precipitation in Ontario Study Quality Assurance for the Network

PRINCIPAL INVESTIGATOR

NAME: P. Fellin

PHONE: (416) 630-6331

AGENCY AND DEPARTMENT:

ADDRESS: CONCORD SCIENTIFIC CORPORATION
2 Tippet Road
Downsview, Ontario
M3H 2V2

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Ontario Ministry of Environment

DURATION: 6 months

APPROXIMATE COST PER YEAR: \$24,000

PROJECT OBJECTIVES/DESCRIPTION

A comprehensive quality assurance manual was prepared for the Acid Precipitation in Ontario Study (APIOS). The manual addresses quality assurance aspects of all the network's major operating components including sample collection protocols, analytical procedures, data reduction and verification routines, documentation and document control techniques and provision for external audits. Lines of responsibility for ensuring timely execution of all network quality assurance/quality control activities were recommended.

PROJECT NUMBER
317

SUBJECT CODE
8.0

LRTAP PROJECT DESCRIPTION

TITLE

LRTAP Interlaboratory Quality Control Studies

PRINCIPAL INVESTIGATOR

NAME: A.S. Fraser

PHONE: (416) 637-4638

AGENCY AND DEPARTMENT: Inland Waters Directorate
Environmental Conservation Service
Environment Canada

ADDRESS: 867 Lakeshore Road
Burlington, Ontario
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: October, 1982

APPROXIMATE COST PER YEAR: \$37,000

PROJECT OBJECTIVES/DESCRIPTION

To define and improve the quality of data generated by laboratories that provide data to the federal-provincial LRTAP programs.

This study is in response to the quality assurance needs.

SUBJECT CODE
8.0

PROJECT NUMBER
318

LRTAP PROJECT DESCRIPTION

TITLE

LRTAP Interlaboratory Quality Control Studies

PRINCIPAL INVESTIGATOR

NAME: K.I. Aspila

PHONE: (416) 336-4638

AGENCY AND DEPARTMENT: National Water Reserach Institute
Environmental Conservation Service
Environment Canada

ADDRESS: Canada Centre for Inland Waters
867 Lakeshore Road
Burlington, Ontario
L7R 4A6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

DURATION: Ongoing

APPROXIMATE COST PER YEAR:

PROJECT OBJECTIVES/DESCRIPTION

To define and improve the quality of data generated by laboratories that provide data to the Federal/Provincial LRTAP program.

1. Generating reference material for major ions and nutrients in water to suit the needs of the LRTAP participants.
2. Sample preparation, verifcaiton and distribution of 3 interlab studies for major ions and nutrients to 30-50 labs.
3. Data evaluation and interpretation.
4. Preparing final reports for each study (one report every 4 months).
5. Investigating and ensuring sample homogeneity and stability.
6. Refinement to out present computer programs for data evaluation.
7. Maintaining liaison with the analysis, managers, data users and the LRTAP subgroup.

SECTION 9

RESEARCH PROGRAM COORDINATORS

LRTAP PROJECT DESCRIPTIONTITLE

Acid Deposition Research program

PRINCIPAL INVESTIGATOR

NAME: Ron. L. Findlay
Carl Primus

PHONE: (403) 233-1741
(403) 427-6247

AGENCY AND DEPARTMENT: Amoco Canada Petroleum Company Ltd.
Environmental Affairs Department

ADDRESS: C333, 444 - 7 Avenue S.W.
Calgary, Alberta
T2P 0Y2

ALSO Mr. Carl Primus
Alberta Environment
14 Floor, 9820 - 106 Street
Edmonton, Alberta T5K 2J6

COOPERATIVE AGENCIES
AND INVESTIGATORS
(IF APPLICABLE):

Canadian Petroleum Association
Alberta Environment
Energy Resources Conservation Board
Alberta Utilities

DURATION: 7 years

APPROXIMATE COST PER YEAR: 1.2 million

PROJECT OBJECTIVES/DESCRIPTION

To provide a comprehensive understanding of the effects and consequences of acid-forming gases on the environment.

To provided a scientific basis for sound, long-term environmental management and regulatory control with respect to acid-forming gases.

To disseminate such information among members, to the public and to government bodies.

To undertake any research deemed appropriate and to encourage and include opportunities for public representation in the A.D.R.P

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